NASA Strategic Plan

1998

With 1999 Interim Adjustments

NASA Policy Directive (NPD)-1000.1a

NASA is an investment in America's future. As explorers, pioneers, and innovators, we boldly expand frontiers in air and space to inspire and serve America and to benefit the quality of life on Earth.

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Administrator's Strategic Outlook

All members of the NASA Team—our employees, contractors, academic researchers, industry, Government, and international partners—should feel a tremendous sense of pride in our many accomplishments over the past 5 years. We have looked back to the beginning of time and discovered new galaxies and planets in other solar systems. We captured the world's imagination with the remarkable achievements of the Mars Pathfinder and Hubble Space Telescope missions. We have increased our understanding of the effect of natural and human-induced activities on our home planet. Investments initiated in the past have increased the competitive posture of the aviation, space launch, and communications industries of the present. On Space Shuttle missions, we have performed experiments and technological feats that are paving the way to an era of permanent human presence in space. These achievements, and many more, are responsible for the resurgence and solidification of interest and support for NASA's activities among the Administration, Congress, and the public.

We intend to build on these accomplishments with a renewed focus on scientific research and the development and application of new cutting-edge technologies. Our unique capabilities will enable us to answer fundamental questions that have challenged humankind for centuries. Our exploration of the unknown will lead to discoveries of new worlds and generate new knowledge that stirs the soul, nourishes the mind, and enriches our lives. We will develop the tools and knowledge to help preserve our freedoms and provide hope and opportunity for future generations.

Mission success starts with safety. We will conduct our business with an enhanced fervor for safety, establishing NASA as the Nation's leader in preventing mishaps that impact the safety or health of the public, our astronauts and pilots, the NASA and contractor workforce, and the national resources under our charge. We will ensure that safety permeates everything we do at NASA. Our management team is fostering an environment that will not tolerate the occurrence of mishaps. We believe that by focusing on the safety of our missions, we will also improve quality and decrease schedule and cost.

In the coming years, NASA will implement programs to achieve a three-part mission encompassing Scientific Research, Space Exploration, and Technology Development and Transfer. This mission describes what we are required to do in response to policy and legislative mandates. In implementing our mission, we will pursue answers to fundamental questions of science and research

that provide a philosophical underpinning for why NASA exists and a foundation for our goals. The questions include:

- How did the universe, galaxies, stars, and planets form and evolve? How can our exploration of the universe and our solar system revolutionize our understanding of physics, chemistry, and biology?

- Does life in any form, however simple or complex, carbon-based or other, exist elsewhere than on planet Earth? Are there Earth-like planets beyond our solar system?

- How can we utilize the knowledge of the Sun, Earth, and other planetary bodies to develop predictive environmental, climate, natural disaster, and natural resource models to help ensure sustainable development and improve the quality of life on Earth?

- What is the fundamental role of gravity and cosmic radiation in vital biological, physical, and chemical systems in space, on other planetary bodies, and on Earth, and how do we apply this fundamental knowledge to the establishment of permanent human presence in space to improve life on Earth?

- How can we enable revolutionary technological advances to provide air and space travel for anyone, anytime, anywhere more safely, more affordably, and with less impact on the environment and improve business opportunities and global security?

- What cutting-edge technologies, processes, and techniques and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner? How can we most effectively transfer the knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?

We will seek answers to these questions with our partners in the science and educational communities, industry, and other governmental agencies in the United States and around the world. As we implement our mission and discover answers to these questions, we will contribute to the achievement of the Nation's science and technology goals and priorities for economic growth and security, sustainable development of the environment, education excellence, and peaceful exploration and discovery.

This Strategic Plan describes the way in which we will implement our mission, answer the questions, and achieve our future goals. The Plan also identifies our customers and articulates where we are going and why. Most importantly, it provides a common basis for the Administration, Congress, and NASA's management to make decisions regarding the implementation of our programs and the deployment of the resources needed to turn the Plan into reality.

This document builds on three previous editions and will be submitted with the Fiscal Year 1999 budget request as prescribed by the Government Performance and Results Act (GPRA). In conjunction with comments received from our customers, stakeholders, employees, and NASA management councils, a number of improvements have been made to this edition of the Plan.

It has been recognized that technology development is not an independent business unit, but is fundamental to the successful performance of each Strategic Enterprise. Therefore, the Space Technology Enterprise has been eliminated, and technology development becomes the responsibility of the remaining four Enterprises. A new position of Chief Technologist was created to provide oversight and guidance for our technology investments. With this new structure, each Enterprise will use technology development as a means to accomplish current programs more efficiently and stimulate new programs necessary to meet our long-term goals. The goal to reduce the cost of access to space that had been associated with the Space Technology Enterprise has been added to the Aeronautics Enterprise. This expanded Enterprise was renamed Aero-Space Technology.

We have improved the level of alignment of the goals of the Agency and our Enterprise goals with the directives prescribed in two Administration policy documents. These are the National Space Policy and the Goals for a National Partnership in Aeronautics Research and Technology. We have also increased our emphasis on the need for synergy between the programs of the Enterprises and the capabilities of our partners in Government, industry, academia, and other nations. Further, we have defined the scope, goals, and objectives for four Crosscutting Processes that are critical to the success of Agency programs and activities. Finally, we have added a core value that demands safety in everything we do.

With the successful development of this Strategic Plan, the NASA Team must now focus on implementation. We have reached a consensus with our stakeholders, customers, and partners on our vision, mission, and roadmap to the future. We intend to implement our programs, projects, and Crosscutting Processes in a manner that enables us to deliver valuable and relevant results more effectively and efficiently. We will be relentless in our pursuit of safety and zero mishaps in all aspects of our work.

Each one of us—individuals who work directly on programs, as well as those who provide critical support capabilities—have an opportunity and responsibility to contribute to the development of a new NASA, the achievement of our plans, and the satisfaction of our customers. I urge all NASA employees, our stakeholders, and our customers to read this Plan and look for ways to support the accomplishment of our ambitious goals for the future.

The NASA Strategic Plan is the backbone of our new Strategic Management System. We welcome comments on the Plan and suggestions for improvement. Let me hear from you with your ideas on ways in which we can improve our ability to meet the needs of the Nation through our aeronautics and space programs.

Daniel S. Goldin
Administrator

NASA's Strategic Management System

The Government Performance and Results Act (GPRA) passed by Congress and signed by the President in 1993 provides a new tool to improve the efficiency of all Federal agencies. The Act directs Executive Branch agencies to develop a customer-focused strategic plan, align agency activities with concrete missions and goals, manage and measure results to justify appropriations and authorizations, and design budgets that reflect strategic missions. The purposes of GPRA are to improve citizen confidence in Government performance, improve Federal program management, effectiveness, and public accountability, and improve congressional decision making on where to commit the Nation's financial and human resources. The Act requires that, beginning with the fiscal year 1999 budget request, agencies submit to the Office of Management and Budget (OMB) and to Congress a strategic plan for program activities and an annual performance plan covering those activities set forth in the budget. Six months after the completion of a fiscal year, agencies are further required to submit a report of program performance that reviews the success in achieving the goals and performance measures defined in the strategic and performance plans.

NASA established a Strategic Management System to provide the information and results to fulfill the planning and reporting requirements of the Act. The System is defined in the *NASA Strategic Management Handbook* (NASA Procedures and Guidelines 1000.2). This Strategic Plan, which will be submitted to OMB, leads a series of documents that defines why the Agency exists and what goals we propose to accomplish over the next 25 years. How we will implement activities to accomplish these goals is further defined in documents developed by Headquarters program offices, functional/staff offices, Centers, program and project managers, and individual employees. In addition to this Strategic Plan, we will submit our resource requirements to OMB in the annual budget request and a 5-year budget plan. We will also submit a Performance Plan that defines how we intend to measure the results and contributions of our programs to the Nation. The graphic on page 7 illustrates the documents that support the Strategic Management System.

The Strategic Plan defines the Agency's vision, three-part mission, and fundamental questions of science and research that provide the reason for why we exist and the foundation for our goals. The Plan further describes four Strategic Enterprises to manage the programs and activities that will implement our mission, be responsible for answering specific fundamental questions, and satisfy the requirements of our customers. Goals are also described for four Crosscutting Processes that provide the support systems that enable each Strategic Enterprise to develop and deliver our products and services to internal and external customers.

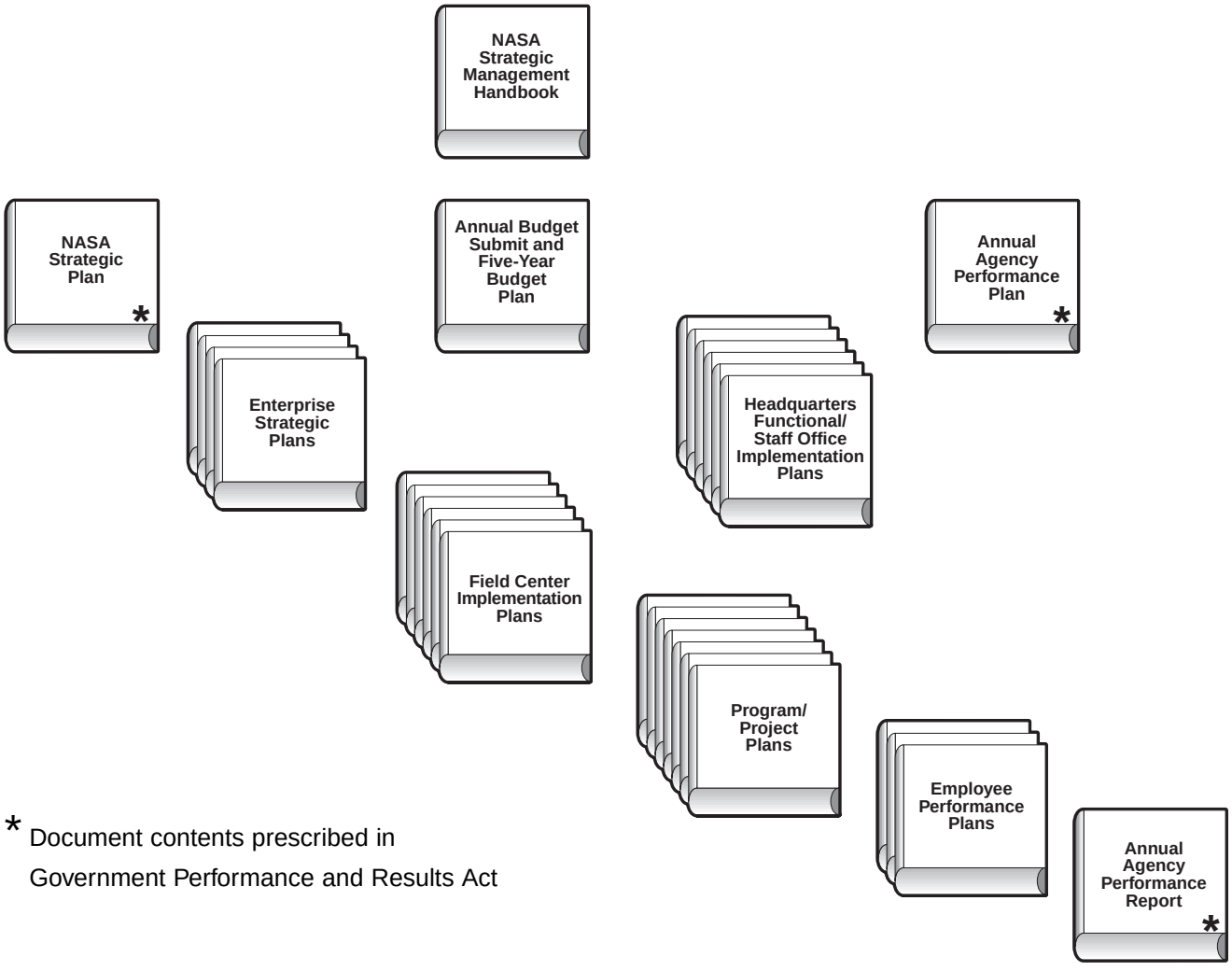
The Agency's goals have been grouped in three timeframes spanning a 25-year period and are displayed on the Roadmap on pages 8 and 9. Each timeframe is defined by a unifying theme that characterizes the primary focus of activity for that period. The initial timeframe for the Roadmap (1998–2002) presents the near-term goals that correlate to NASA's fiscal year 1998 budget and the President's 5-year budget plan. Mid- and long-term goals are presented in the 2003–2009 and 2010–2023 timeframes, respectively. These goals represent a balanced set of science, exploration, and technology development outcomes that we believe can be

accomplished over the next 25 years. While the mid- and long-term goals will be executed in timeframes that exceed current budget authority, they represent a strategic direction that is consistent with our vision and mission. Specific resource requirements to achieve these goals will be requested in subsequent budget cycles.

The ultimate outcome of achieving our vision, implementing our legislated mission, answering fundamental questions, and accomplishing our goals is our contribution to national science and technology priorities. The investment in our programs contributes to increased understanding of science and technology, sustainable development of the environment, educational excellence, peaceful exploration and discovery, and economic growth and security.

Within this Plan, we also present Roadmaps for each of the four Strategic Enterprises, which define the objectives to meet the Agency's goals. These Enterprise objectives and the objectives of our Crosscutting Processes form the basis for NASA's Performance Plan and our performance evaluation process.

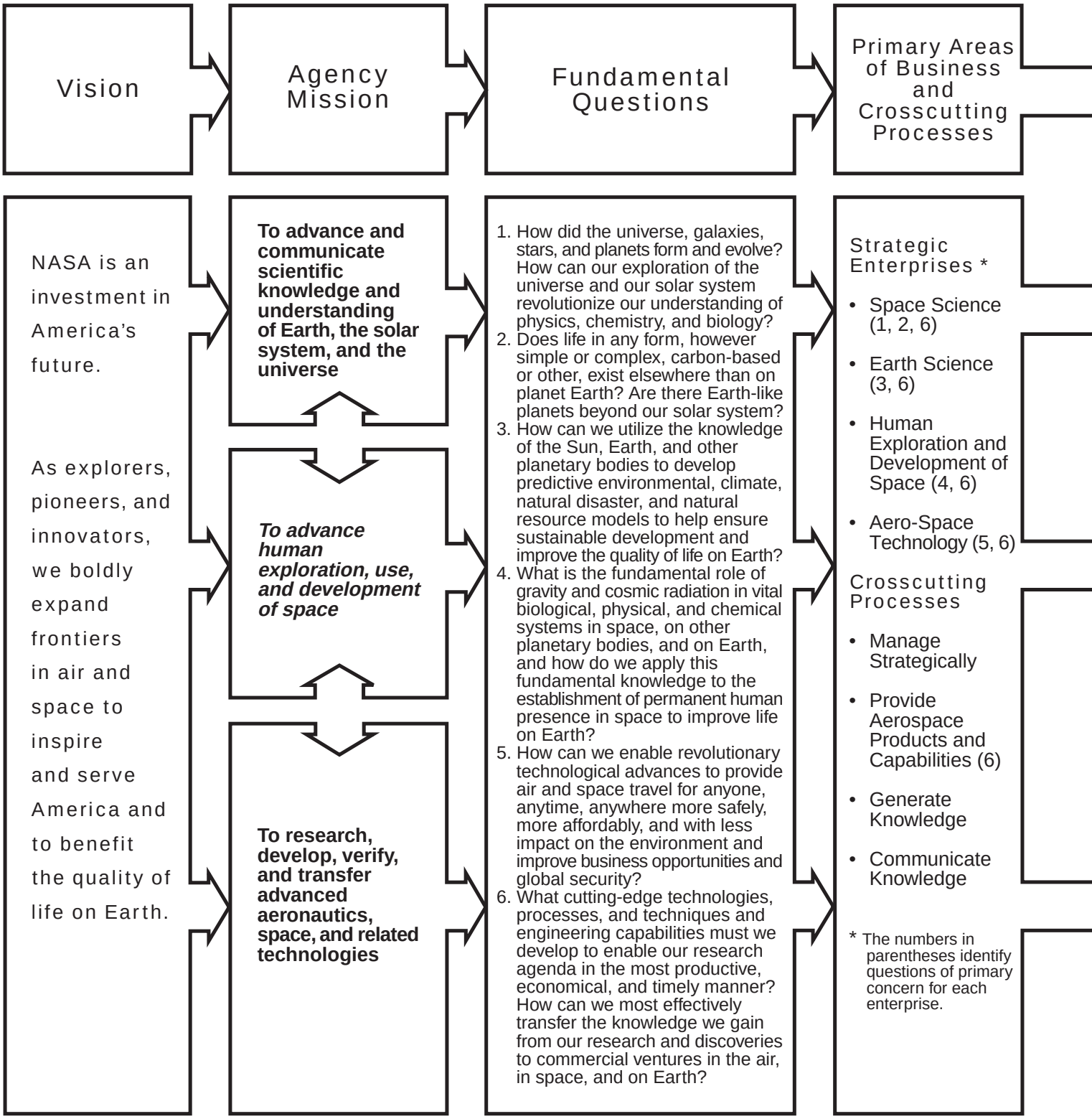
NASA's Strategic Management System Documents

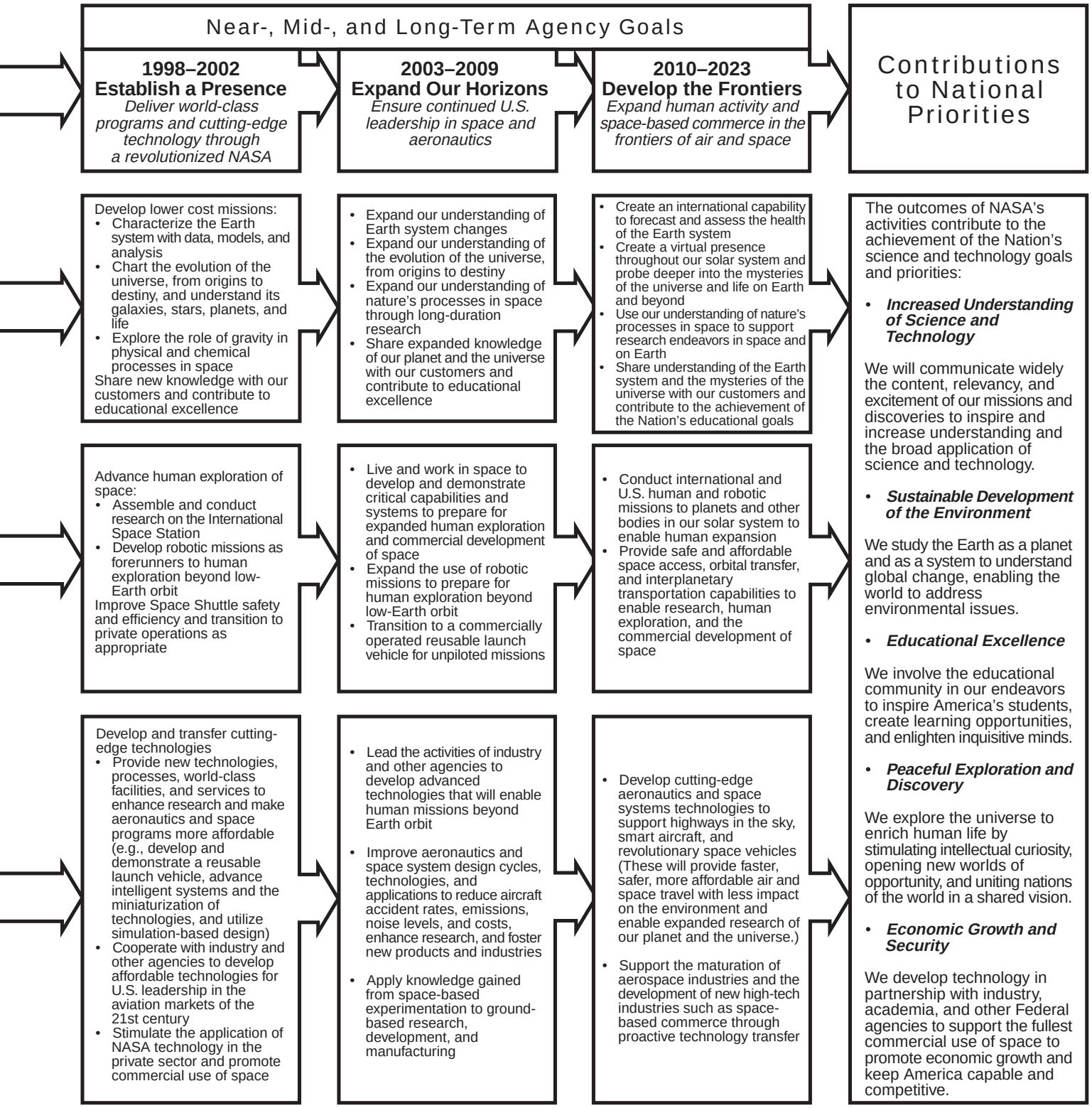


* Document contents prescribed in Government Performance and Results Act

NASA's Strategic Management System Roadmap

Vision, Mission, Questions, Roadmap and Goals, and Contributions to National Priorities




Near-, Mid-, and Long-Term Agency Goals
1998–2002
Establish a Presence
Deliver world-class programs and cutting-edge technology through a revolutionized NASA
2003–2009
Expand Our Horizons
Ensure continued U.S. leadership in space and aeronautics
2010–2023
Develop the Frontiers
Expand human activity and space-based commerce in the frontiers of air and space
Contributions to National Priorities
Develop lower cost missions:
• Characterize the Earth system with data, models, and analysis
• Chart the evolution of the universe, from origins to destiny, and understand its galaxies, stars, planets, and life
• Explore the role of gravity in physical and chemical processes in space
Share new knowledge with our customers and contribute to educational excellence
• Expand our understanding of Earth system changes
• Expand our understanding of the evolution of the universe, from origins to destiny
• Expand our understanding of nature's processes in space through long-duration research
• Share expanded knowledge of our planet and the universe with our customers and contribute to educational excellence
• Create an international capability to forecast and assess the health of the Earth system
• Create a virtual presence throughout our solar system and probe deeper into the mysteries of the universe and life on Earth and beyond
• Use our understanding of nature's processes in space to support research endeavors in space and on Earth
• Share understanding of the Earth system and the mysteries of the universe with our customers and contribute to the achievement of the Nation's educational goals
Advance human exploration of space:
• Assemble and conduct research on the International Space Station
• Develop robotic missions as forerunners to human exploration beyond low-Earth orbit
Improve Space Shuttle safety and efficiency and transition to private operations as appropriate
• Live and work in space to develop and demonstrate critical capabilities and systems to prepare for expanded human exploration and commercial development of space
• Expand the use of robotic missions to prepare for human exploration beyond low-Earth orbit
• Transition to a commercially operated reusable launch vehicle for unpiloted missions
• Conduct international and U.S. human and robotic missions to planets and other bodies in our solar system to enable human expansion
• Provide safe and affordable space access, orbital transfer, and interplanetary transportation capabilities to enable research, human exploration, and the commercial development of space
Develop and transfer cutting-edge technologies
• Provide new technologies, processes, world-class facilities, and services to enhance research and make aeronautics and space programs more affordable (e.g., develop and demonstrate a reusable launch vehicle, advance intelligent systems and the miniaturization of technologies, and utilize simulation-based design)
• Cooperate with industry and other agencies to develop affordable technologies for U.S. leadership in the aviation markets of the 21st century
• Stimulate the application of NASA technology in the private sector and promote commercial use of space
• Lead the activities of industry and other agencies to develop advanced technologies that will enable human missions beyond Earth orbit
• Improve aeronautics and space system design cycles, technologies, and applications to reduce aircraft accident rates, emissions, noise levels, and costs, enhance research, and foster new products and industries
• Apply knowledge gained from space-based experimentation to ground-based research, development, and manufacturing
• Develop cutting-edge aeronautics and space systems technologies to support highways in the sky, smart aircraft, and revolutionary space vehicles (These will provide faster, safer, more affordable air and space travel with less impact on the environment and enable expanded research of our planet and the universe.)
• Support the maturation of aerospace industries and the development of new high-tech industries such as space-based commerce through proactive technology transfer
The outcomes of NASA's activities contribute to the achievement of the Nation's science and technology goals and priorities:
• Increased Understanding of Science and Technology
We will communicate widely the content, relevancy, and excitement of our missions and discoveries to inspire and increase understanding and the broad application of science and technology.
• Sustainable Development of the Environment
We study the Earth as a planet and as a system to understand global change, enabling the world to address environmental issues.
• Educational Excellence
We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.
• Peaceful Exploration and Discovery
We explore the universe to enrich human life by stimulating intellectual curiosity, opening new worlds of opportunity, and uniting nations of the world in a shared vision.
• Economic Growth and Security
We develop technology in partnership with industry, academia, and other Federal agencies to support the fullest commercial use of space to promote economic growth and keep America capable and competitive.

In developing the Strategic Plan, we assessed how domestic and foreign policy priorities and political and public support have changed in the post–Cold War era. This assessment provided the basis for key assumptions that have been factored into our program strategies. Our annual review process will include a reassessment of the dynamic business and political environment in which we operate to ensure that our assumptions and strategies remain valid.

Domestic Policy

Domestic policy priorities are being adjusted in light of the Federal deficit, constrained budgets, and the need to maintain America's vitality and competitiveness. The Administration has placed a priority on supporting and promoting high technology for economic growth through effective partnerships, both within Government and with industry and academia. Therefore, NASA will work closely with other Federal agencies to ensure coordinated efforts in the areas of space and aeronautics science and technology. With increased emphasis on pressing domestic needs, we will ensure the relevance of our programs to national science and technology priorities and to other domestic goals in areas such as the environment, health, education, and aviation safety.

The National Aeronautics and Space Act of 1958 (Space Act) established NASA and laid the foundation for its mission. It directs NASA to conduct space activities devoted to peaceful purposes for the benefit of all humankind. We are to preserve the leadership of the United States in aeronautics and space science and technology, and we are to expand knowledge of the Earth and space. We are to conduct human activities in space. We are to encourage the fullest commercial use of space. Furthermore, we are to cooperate with other nations and are directed to widely communicate the results of our efforts.

Two Presidential policy statements also shape NASA's activities in space and aeronautics. The top-level goals of these policies are displayed below. The complete documents, which are aligned with this Plan, can be accessed as indicated in the Appendix.

First, the President's National Space Policy defines the following goals:

- Enhance knowledge of the Earth, the solar system, and the universe through human and robotic exploration;
- Strengthen and maintain the national security of the United States;
- Enhance the economic competitiveness and the scientific and technical capabilities of the United States;
- Encourage State, local, and private investment in, and use of, space technologies; and
- Promote international cooperation to further U.S. domestic, national security, and foreign policies.

The National Space Policy also provides guidelines designating NASA as the lead agency for research and development in civil space activities. NASA, in coordination with other departments and agencies, is to focus its research and development efforts in: space science to enhance knowledge of the solar system, the universe, and fundamental natural and physical sciences; Earth observation to better

understand global change and the effect of natural and human influences on the environment; human space flight to conduct scientific, commercial, and exploration activities; and space technologies and applications to develop new technologies in support of U.S. Government needs and our economic competitiveness.

Second, the President's Goals for a National Partnership in Aeronautics Research and Technology includes the following:

- Maintain the superiority of U.S. aircraft and engines;
- Improve the safety, efficiency, and cost-effectiveness of the global air transportation system; and
- Ensure the long-term environmental compatibility of the aviation system.

Foreign Policy

In the post–Cold War era, the foreign policy aspect of the civil space program will focus on a spirit of expanded cooperation with our traditional international partners and the forging of new partnerships. The Administration has asked NASA to play a major role in international ventures with Russia to expand space exploration opportunities and to promote the peaceful uses of technology. There are also increased opportunities for cooperation with developing countries. These new relationships, along with strengthened ties to our traditional partners in Europe, Japan, and Canada, can help reinforce the economic and technological bonds in the new global society. As NASA moves forward with increased levels of international cooperation, it must balance the benefits that will result from joint endeavors with our own national policies and priorities.

Political and Public Support

A commitment from America's political leadership is vital to our success. The President has demonstrated his support for NASA and has indicated that we will play a significant role in the Administration's science and technology agenda and its foreign policy initiatives. In Congress, NASA continues to enjoy significant bipartisan support. Sustained political support will depend on our ability to demonstrate a contribution to national needs and to deliver on our promises.

Public support for NASA's programs has been positive and generally stable throughout our history. Recent public opinion polls continue to indicate solid support for U.S. endeavors in space. A number of recent discoveries and accomplishments have served to increase the level of public interest and support of NASA's programs. These include the possible evidence of ancient life discovered in a meteorite from Mars, exciting images of the surface of Mars from the Mars Pathfinder, dramatic pictures from the Hubble Space Telescope of the birth and death of stars, discoveries of planets around other stars, and images from the Galileo spacecraft of the fractured and deformed icy surface of Jupiter's moon Europa. In the area of Earth science, the SeaWiFS ocean color sensor, developed through innovative partnerships with industry, is providing significant new data about the ocean. In addition, the highly visible long-term missions of NASA astronauts aboard the Space Shuttle and Russian space station *Mir* have engaged public interest in the challenges of living and working in space. Successful demonstrations of aeronautics technologies to enhance aviation system capacity and safety have also attracted great public attention. Continued public support will depend on our ability to satisfy the Nation's needs and to keep the public fully informed about the results and relevance of our activities.

Key External Factors

We identified the following key assumptions, which if significantly changed could impact our ability to implement this Plan:

- The current national aeronautics and space policies, national priorities and goals, and our legislative mandates form the basis for the four Strategic Enterprises and their respective goals and objectives. Changes in policies, priorities, goals, and mandates could cause NASA to reevaluate its current goals and structure of each Enterprise.
  - Understanding the Earth's environment and global change will continue to be an important national priority requiring NASA's leadership in space observations and research.
  - Space science will remain an integral part of the national program of basic scientific research.
  - Human activity in space will continue to play a vital role in the Nation's program of scientific and technological research.
  - There will continue to be a viable U.S. industrial and academic base for aeronautics and space activities. NASA technology will continue to be valuable to industry in enhancing U.S. competitiveness. NASA will continue to have a leading role in developing aeronautics technology jointly with other agencies, industry, and academia that will support the safety and efficiency of the national air transportation system.
- NASA's budget will be consistent with the President's 5-year plan and will remain stable thereafter. Significant decreases in our budget will cause the Agency to reassess its current complement of programs in all four Enterprises.
- Interagency and international cooperation will be increasingly important in achieving NASA's missions. Failure by participants to honor commitments defined in cooperative agreements could cause NASA to pursue other options to achieve program goals.
- The International Space Station will be successfully developed, deployed, and utilized as a research platform through a partnership involving Canada, Europe, Japan, Russia, and possibly other nations. The successful development of the International Space Station will support future national decisions regarding human missions beyond Earth orbit. Failure to deploy the International Space Station could seriously impede our ability to achieve our long-term goals of conducting U.S. and international human missions to planets and other bodies in our solar system, as well as understanding nature's processes in space.
- The Administration and Congress will rely on NASA to buy commercial launch services and, when necessary, to form partnerships with industry to help create new technological capabilities for lower costs and more reliable civil, national security, and commercial access to space. The Space Shuttle will support NASA missions until a new human-rated launch system is developed. NASA's long-term goal to provide safe and affordable space travel to enable research and human expansion relies on the development of a reusable launch vehicle and/or significant improvements to the Space Shuttle.

Framework

External Customers

The NASA Strategic Plan is based on a commitment to satisfy our external customers. Our performance in carrying out programs, and our success as an Agency, will be judged by our customers, based on our ability to meet their requirements.

We have identified the following groups as our external customers and stakeholders (see figure, page 14):

- The Administration and Congress, our primary stakeholders, provide us with the policy direction and financial resources to conduct the Nation's aeronautics and space programs.

- The science and education communities, aerospace and nonaerospace industries, Federal agencies, and other primary customers receive our products directly and use them for purposes that yield public benefit.

- The public is both the ultimate resource provider and the ultimate beneficiary of our products.

Strategic Enterprises

The NASA Strategic Plan establishes a framework for making management decisions by separating the Agency's programs into four Strategic Enterprises through which we implement our mission and communicate with our external customers:

- Space Science
- Earth Science
- Human Exploration and Development of Space (HEDS)
- Aero-Space Technology (AST)

NASA's Strategic Enterprises identify at the most fundamental level what we do and for whom. They focus us on the ends, not the means, of our endeavors. Each of our Strategic Enterprises is analogous to a strategic business unit, employed by private-sector companies to focus on and respond to its customers' needs. Each Strategic Enterprise has a unique set of goals, objectives, and strategies that address the requirements of its primary external customers. However, each Enterprise must ensure synergy with and support of the Agency's common goals and the strategies of the other Enterprises.

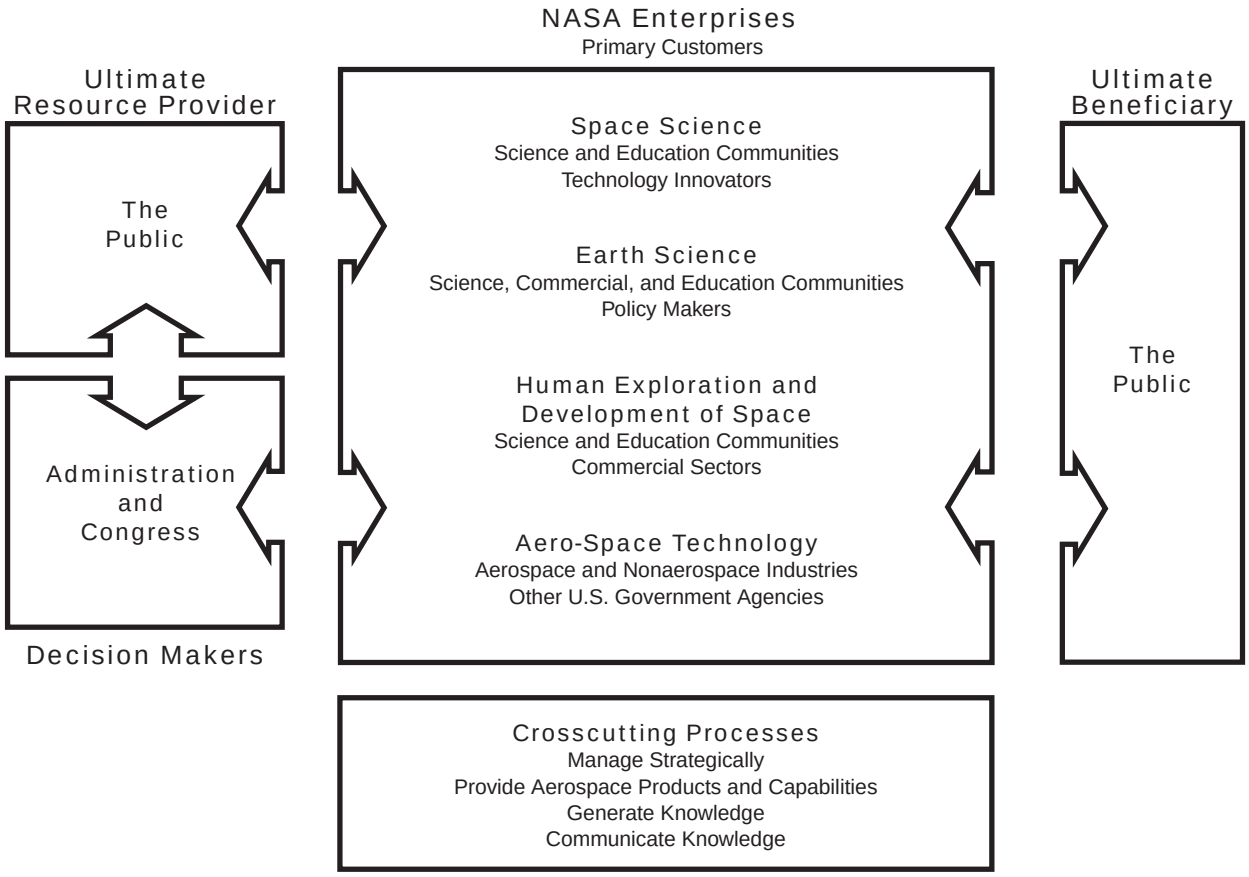
Although NASA's broad mission is driven by the Space Act, the specific programs that are conducted within its Enterprises, and the priorities placed on them, are driven by the directives of the Administration and Congress. As such, the programmatic content of the Enterprises changes over time as we respond to shifts in customer needs and domestic and international policy priorities. The specific content of activities for the Enterprises is presented within their own Strategic Plans. The development of a balanced set of programs and Agency priorities among the Enterprises will lay the groundwork for the budget process.

Crosscutting Processes

Underlying NASA's activities are critical processes that are the means by which we develop and deliver our products and services to internal and external customers. In performing their jobs, all NASA employees are engaged in one or more of these processes. Through these we transform inputs, such as policies and resources, into outputs, such as knowledge.

The Manage Strategically process focuses on activities that provide both critical capabilities to

Stakeholders, Enterprises, Customers, and Beneficiaries



our internal customers and external coordination with oversight and audit agencies of the Administration and Congress. NASA's other processes—Provide Aerospace Products and Capabilities, Generate Knowledge, and Communicate Knowledge—are primarily implemented by the Agency across its Strategic Enterprises to support external customers.

In carrying out these processes, NASA is employing overarching strategies to enhance our position as a premier research and development agency and to align our activities with the policies and directives of the Administration and Congress. Our ability to respond to future opportunities under tight fiscal constraints requires us to become more effective and efficient. Effective implementation of these processes will help us deliver better products and services and cut development time and costs in current and future programs.

The NASA Team

The goals stated in this Plan will be accomplished by a diverse group of men and women at our Headquarters, nine Centers throughout the country, and the Jet Propulsion Laboratory. We will also rely on partnerships with both large and small contractors, members of the academic community, other Federal, State, and local agencies, and other space agencies from nations around the globe.

This highly skilled team of scientists, engineers, technicians, and administrative and support professionals is dedicated to providing high-quality, technologically superior products and services in aeronautics and space. Through our dedication and professionalism, we will carry out our mission, achieve our goals and objectives, and ultimately find answers to the fundamental questions of science and research.

NASA Values

To implement this Plan, the NASA Team will strive to uphold core values related to people, excellence, and integrity.

Safety

Safety permeates everything we do at NASA, and the entire NASA workforce is committed to safety as a priority. The NASA management team is held accountable for safety. We foster an environment with zero tolerance for mishaps. We must protect the safety and health of the general public and the NASA workforce on and off the ground. By focusing on the safety of our missions, we also focus on improving quality and decreasing schedule and cost.

People

Our greatest strength is our workforce. We aggressively build a team of highly qualified individuals that is representative, at all levels, of America's diversity. We foster a culture that is built on trust, respect, teamwork, communication, creativity, and empowerment in an environment that is free of unlawful discrimination and ensures equal opportunity for all.

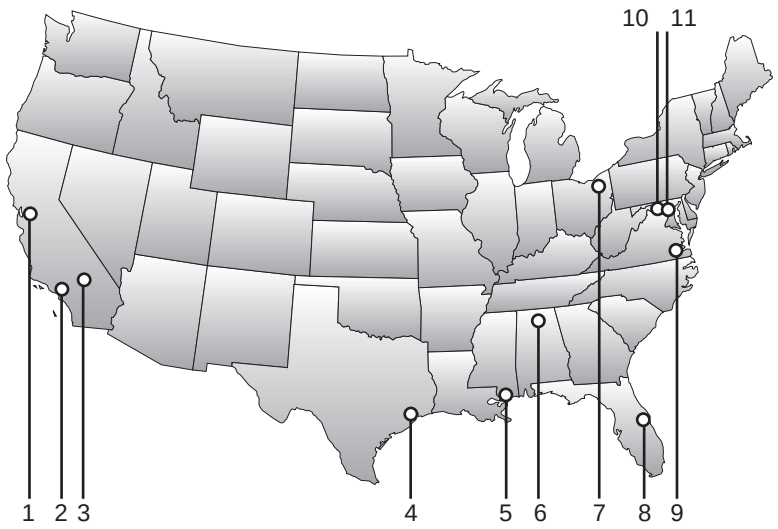
Excellence

We are committed to demonstrating and promoting excellence and continually improving processes, products, and services to better satisfy our customers' needs and requirements. We utilize quality-focused leadership and management, as well as scientific, engineering, and technical excellence to provide our customers with highly valued products and services in the most cost-effective, timely, and safe manner.

Integrity

We preserve America's confidence and trust by ensuring that our missions are consistent with national goals, carefully conceived, and well executed. We deliver on our promises and are accountable for our performance. We are open and honest with one another and with our customers, and we cooperate within and across organizations to deliver the highest quality results. We are bold but prudent in confronting challenges and accepting risks. We work with integrity and are dedicated to fulfilling our vision in an environment in which adherence to fundamental ethical principles and compliance with related laws and regulations flourish.

Centers of Excellence



1	**Ames Research Center**	Information Technology
2	**Jet Propulsion Laboratory**	Deep Space Systems
3	**Dryden Flight Research Center**	Atmospheric Flight Operations
4	**Johnson Space Center**	Human Operations in Space
5	**Stennis Space Center**	Rocket Propulsion Test
6	**Marshall Space Flight Center**	Space Propulsion
7	**Glenn Research Center**	Turbomachinery
8	**Kennedy Space Center**	Launch and Payload Processing Systems
9	**Langley Research Center**	Structures and Materials
10	**NASA Headquarters**	Agency Management
11	**Goddard Space Flight Center**	Scientific Research

Headquarters and NASA Centers

NASA's programs are implemented through its nine Centers and the Jet Propulsion Laboratory. To improve the efficiency and effectiveness of our programs, we have defined the roles and responsibilities for each Center. To reduce overlap and streamline administrative and programmatic functions, NASA's senior management has established areas of excellence and specific missions for each Center and Headquarters.

Agency management, which primarily resides at NASA Headquarters, is responsible for leadership and management across the Strategic Enterprises as well as the development of strategy ("what, why, and for whom"). It serves as the principal interface with the Administration and Congress and is the focal point for accountability, communication, and liaison with external entities. It also provides budget integration, long-term institutional investment strategy, Agency policy and procedures, and functional leadership.

Each Center of Excellence (identified in the figure on page 15) represents a focused, Agency-wide leadership responsibility in a specific area of technology or knowledge. Centers of Excellence are chartered with a clear definition of their capabilities and boundaries. They are charged to be preeminent within the Agency, if not worldwide, with respect to the human resources, facilities, and other critical capabilities associated with the particular area of excellence. Each Center of Excellence must maintain or increase the Agency's preeminent position in the assigned area in line with the program requirements of the Strategic Enterprises and the long-term interests of the Agency. The capabilities to support a Center of Excellence can be distributed across multiple Centers. These capabilities are available to all of the Strategic Enterprises.

Center Missions, which are described in the four Strategic Enterprise sections, identify the concentration of capabilities to support the accomplishment of Strategic Enterprise goals. Each Center has been assigned responsibilities, which provide a basis for building human resource capabilities and a physical infrastructure in direct support of Enterprise requirements. Enterprise program and project assignments are based on Center Mission designations. Other Centers may support a primary Center in carrying out an Enterprise's missions.

In general, each NASA program is assigned to a Lead Center, which is responsible for implementation, accountability for meeting schedule and budget guidelines, and safety and reliability standards.

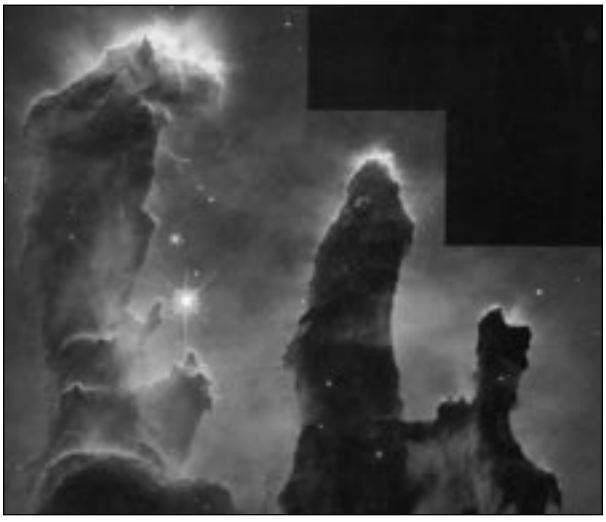
Space Science Enterprise

Mission

Humans have a profound and distinguishing imperative to understand our origin, our existence, and our fate. For millennia, we have gazed at the sky, observed the motions of the Sun, Moon, planets, and stars, and wondered about the universe and the way we are connected to it. The Space Science Enterprise serves this human quest for knowledge. As it does so, it seeks to inspire our Nation and the world, to open young minds to broader perspectives on the future, and to bring home to every person on Earth the experience of exploring space.

The mission of the Space Science Enterprise is to solve mysteries of the universe, explore the solar system, discover planets around other stars, search for life beyond Earth; from origins to destiny, chart the evolution of the universe and understand its galaxies, stars, planets, and life.

In pursuing this mission, we develop, use, and transfer innovative space technologies that provide scientific and other returns to all of NASA's Enterprises, as well as globally competitive economic returns to the Nation. We also use our knowledge and discoveries to enhance science, mathematics, and technology education and the scientific and technological literacy of all Americans.



Star birth in the Eagle Nebula as revealed by the Hubble Space Telescope.

Questions to Address

In accomplishing its mission, the Space Science Enterprise addresses most directly the following NASA fundamental questions:

- How did the universe, galaxies, stars, and planets form and evolve? How can our exploration of the universe and our solar system revolutionize our understanding of physics, chemistry, and biology?
- Does life in any form, however simple or complex, carbon-based or other, exist elsewhere than on planet Earth? Are there Earth-like planets beyond our solar system?

Goals

The four long-term goals of the Space Science Enterprise are as follows:

- Establish a virtual presence throughout the solar system, and probe deeper into the mysteries of the universe and life on Earth and beyond—a goal focused on the fundamental science we will pursue;
- Pursue space science programs that enable and are enabled by future human exploration beyond low-Earth orbit—a goal exploiting the synergy with the human exploration of space;
- Develop and utilize revolutionary technologies for missions impossible in prior decades—a goal recognizing the enabling character of technology; and
- Contribute measurably to achieving the science, mathematics, and technology education goals of our Nation, and share widely the excitement and inspiration of our missions and discoveries—a goal reflecting our commitment to education and public outreach.

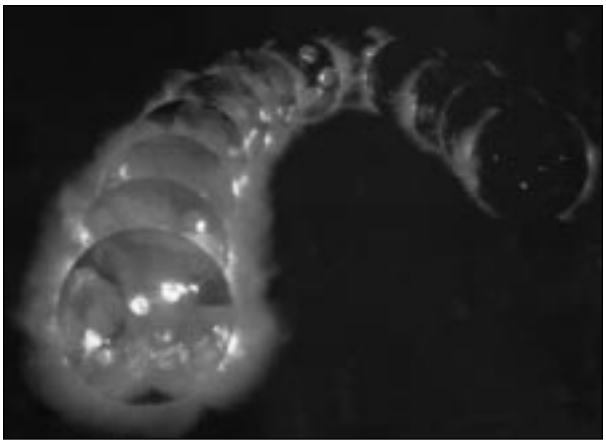
Strategies and Outcomes

The Space Science Enterprise pursues the study of origins, as well as studies of the evolution and destiny of the cosmos, by establishing a continuum of exploration and science. It creates a virtual presence in the solar system, exploring new territories and investigating the solar system in all its complexity. It simultaneously probes the universe to the beginning of time, looking ever deeper with increasingly capable telescopes, scanning the entire electromagnetic spectrum from gamma rays to radio wavelengths. It also sends probes into interstellar space, beginning a virtual presence even beyond the solar system.

The strategy of the Enterprise is to conduct world-class research, to maximize the scientific yield from our current missions, and to develop and deploy new missions within the "faster, better, cheaper" framework of a revolutionized NASA.

Fulfilling one major commitment of previous strategic planning, the Enterprise will complete the deployment of the four "Great Observatories" with the launch of the Chandra X-ray Observatory (formerly AXAF) in 1999 and the Space Infrared Telescope Facility (SIRTF) in 2001. Complementing the discoveries of the Hubble Space Telescope and the Compton Gamma Ray Observatory launched earlier in this decade, Chandra and SIRTF are certain to add to this bounty and help unravel the mysteries of the universe.

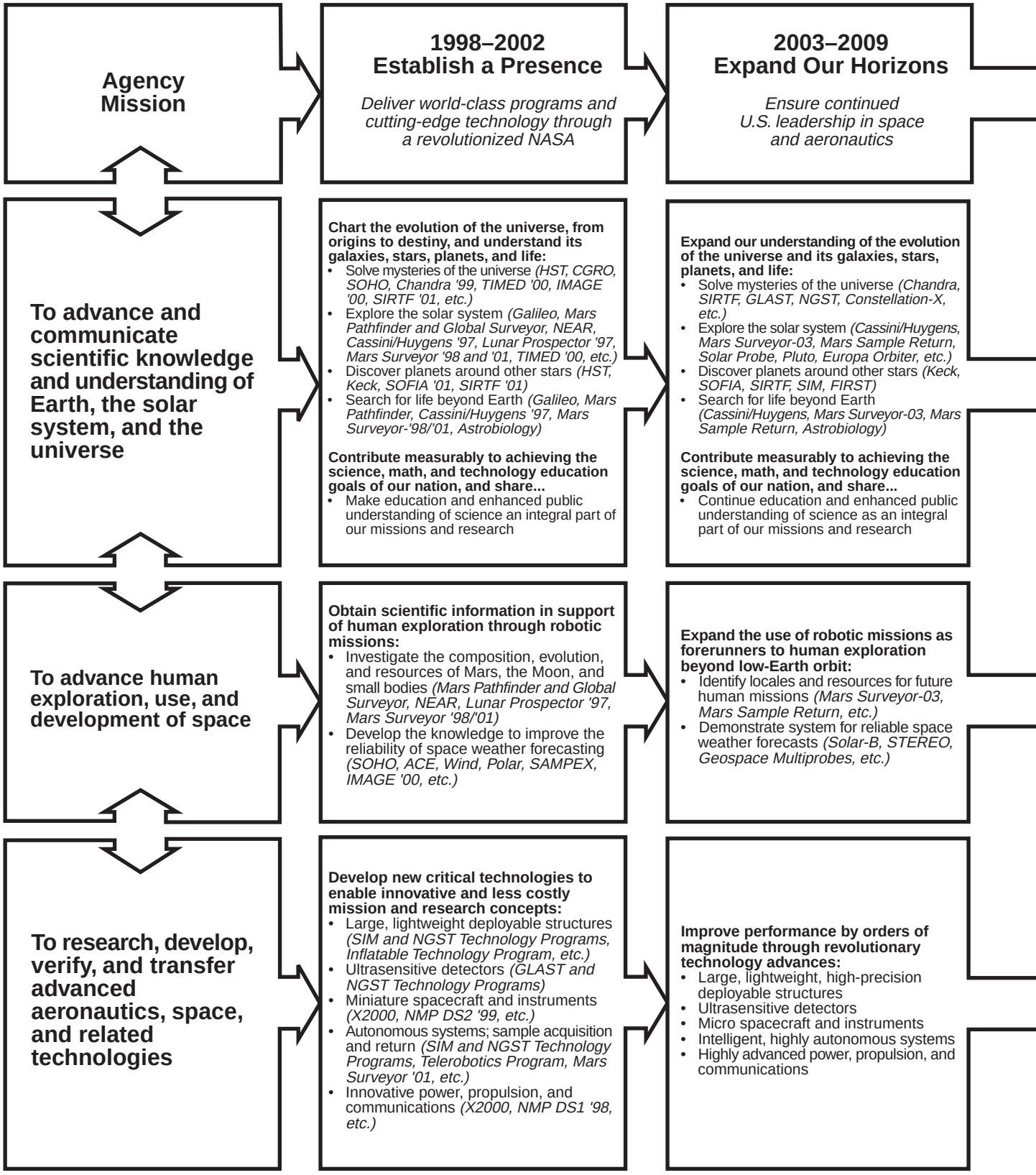
Key elements of the Enterprise program will include a sustained program of robotic research, exploration, and technology development on the surface of Mars, a long-term program to obtain in situ measurements and to return samples from solar system bodies, and a progressive initiative to identify and characterize planets around other stars.



Changes in solar activity affect Earth in many ways. These 12 x-ray images between 1991 and 1995 demonstrate the Sun's variability.

With the brilliant successes of the Mars Pathfinder, Lunar Prospector, and Transition Region and Coronal Explorer (TRACE), these Discovery and Explorer missions have visibly demonstrated that the Enterprise's "faster, better, cheaper" programs can achieve exciting results and yield superb science. The Enterprise will develop and use innovative technologies and more capable spacecraft to improve performance and lower costs of future science missions. Through programs such as Discovery and Explorer, the Enterprise will accept prudent risk, shorten development time, explore new conceptual approaches, streamline management, and make other changes to enhance efficiency and effectiveness.

A key aspect of our strategic planning is to ensure the Enterprise acquires the advice of the external science community, and in particular the National Academy of Sciences. In addition, there is extensive collaboration with this community, international partners, and other Federal agencies, such as the National Science Foundation, Department of Defense, and Department of Energy, in the conduct of our missions and research. This collaboration is discussed more fully on page 35 of this Plan.



The Roadmap presents the overall goals (presented in bold), objectives (presented as bullets), and major program milestones and related activities (presented in parentheses and italics) for the Enterprise.

2010–2023
Develop the Frontiers

Expand human activity and space-based commerce in the frontiers of air and space

Establish a virtual presence throughout the solar system, and probe deeper into the mysteries of the universe and life on Earth and beyond

Contribute measurably to achieving the science, mathematics, and technology education goals of our Nation, and share widely the excitement and inspiration of our missions and discoveries

Pursue space science programs that enable and are enabled by future human exploration beyond low-Earth orbit

Develop and utilize revolutionary technologies for missions impossible in prior decades

As a visible link to future human exploration beyond Earth orbit, Space Science Enterprise robotic missions help develop the scientific knowledge such ventures will need. At the same time, the Enterprise will benefit from the opportunities human exploration will offer to conduct scientific research that may stretch beyond the capabilities of robotic systems. The Space Station will be used for long-term monitoring of the space environment and some investigations requiring large collecting-area detectors (for example, cosmic ray instruments).

To achieve its long-term science goals, the Enterprise will advance the technical state of the art in lightweight and deployable structures, component miniaturization, detector sensitivity, intelligent systems and autonomous operations, and simulation-based design. Continued innovation in these areas is needed to enable smaller spacecraft, which can be developed more rapidly and launched more cheaply, to be more reliable and to return increasing amounts of scientific data. A flight validation program will expedite the introduction of these innovations into science missions by demonstrating them first in flight. These principles will also be applied by the Enterprise to the core program of crosscutting technology development that it conducts for Agencywide benefit.

The public is both an investor in space science research and the ultimate customer and beneficiary. The Enterprise strives to serve the public by clearly communicating its research results and the excitement of space exploration. It supports educational organizations nationwide and seeks to apply the special talents of the space science community to educational improvement. It also strives to transfer technologies to the private sector and to develop strong and lasting partnerships among industry, academia, and Government so that the Nation reaps maximum scientific and economic benefits from its Space Science Program.

Roles and Responsibilities

The NASA Centers' primary missions to support the Space Science Enterprise are listed in the table below.

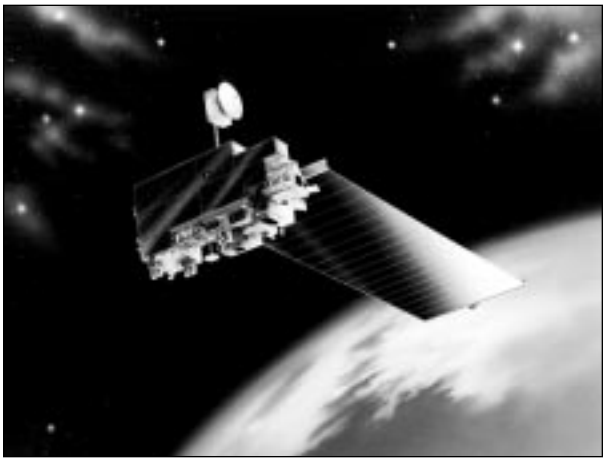
Center	Mission
Ames Research Center	Astrobiology
Goddard Space Flight Center	Physics and Astronomy
Jet Propulsion Laboratory	Planetary Science and Exploration
Johnson Space Center	Astro Materials

Earth Science Enterprise

Mission

NASA's Earth Science Enterprise is dedicated to understanding the total Earth system and the effects of natural and human-induced changes on the global environment. The Earth Science Enterprise is pioneering the new discipline of Earth system science, with a near-term emphasis on global climate change. Space-based and in situ capabilities presently being used or developed yield new scientific understanding and practical benefits to the Nation.

To preserve and improve Earth's environment for future generations, governments around the world need policies based on the strongest possible scientific understanding. Commercial firms, natural resource managers, and educators rely on a dependable stream of this same new knowledge. The unique vantage point of space provides information about Earth's land, atmosphere, ice, oceans, and biota that is obtainable in no other way. In concert with the global research community, including the National Oceanic and Atmospheric Administration and the other agencies participating in the U.S. Global Change Research Program, the Earth Science Enterprise is developing the understanding needed to support the complex environmental policy and economic investment decisions that lie ahead.



The EOS-AM1 spacecraft (named to indicate its morning equatorial crossing time) will be launched in mid-1998. Its instrument complement is designed to obtain data on key parameters of global climate change: the physical and radiative properties of clouds; air-land and air-sea exchanges of energy, carbon, and water; measurements of important trace gases; and volcanology.

Questions to Address

Earth Science addresses the fundamental question: How can we utilize the knowledge of the Sun, Earth, and other planetary bodies to develop predictive environmental, climatic, natural disaster, and natural resource models to help ensure sustainable development and improve the quality of life on Earth?

Goals

The goals of the Earth Science Enterprise are as follows:

- Expand scientific knowledge of the Earth system using NASA's unique vantage points of space, aircraft, and in situ platforms, creating an international capability to forecast and assess the health of the Earth system;
- Disseminate information about the Earth system; and
- Enable the productive use of Earth science and technology in the public and private sectors.

Strategies and Outcomes

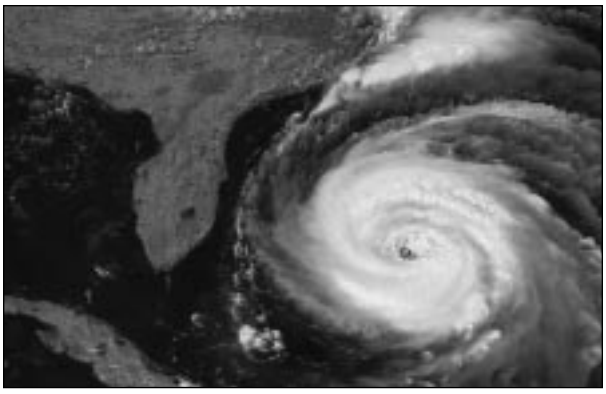
To accomplish these goals, the Earth Science Enterprise employs a strategy that establishes science priorities with near-term product milestones on a path of long-term inquiry; develops advanced technologies that lead to new and lower cost scientific investigations; promotes extensive international collaboration and cooperation with other Federal agencies; contributes to national and international

assessments of the environment; fosters commercial use of remote-sensing data and leverages the resources of the commercial remote-sensing industry to lower the cost of acquiring data; and strengthens Earth science education and public awareness.

These goals, and the strategies that follow, implement the President's National Space Policy of September 1996. This Policy requires NASA to undertake "a program of long-term observation, research, and analysis of the Earth's land, oceans, atmosphere and their interactions, including continual measurements from the Earth Observing System. . . . In carrying out these activities, NASA will develop new and innovative space technologies and smaller more capable spacecraft to improve the performance and lower the cost of future space missions."

Through 2002, the Enterprise will deploy the first series of Earth Observing System (EOS) missions, including Landsat 7. These will join our currently operating spacecraft, such as the Tropical Rainfall Measuring Mission (TRMM). This period will also see the first launches of Earth System Science Pathfinder small satellite missions for new scientific investigations. In tandem, a strong program of aircraft and other field campaigns will validate and supplement spacecraft measurements. Modeling and assessment activities will turn the data collected into widely useful information products for research and applications. These programs are detailed in the Earth Science Strategic Enterprise Plan and supporting strategy documents.

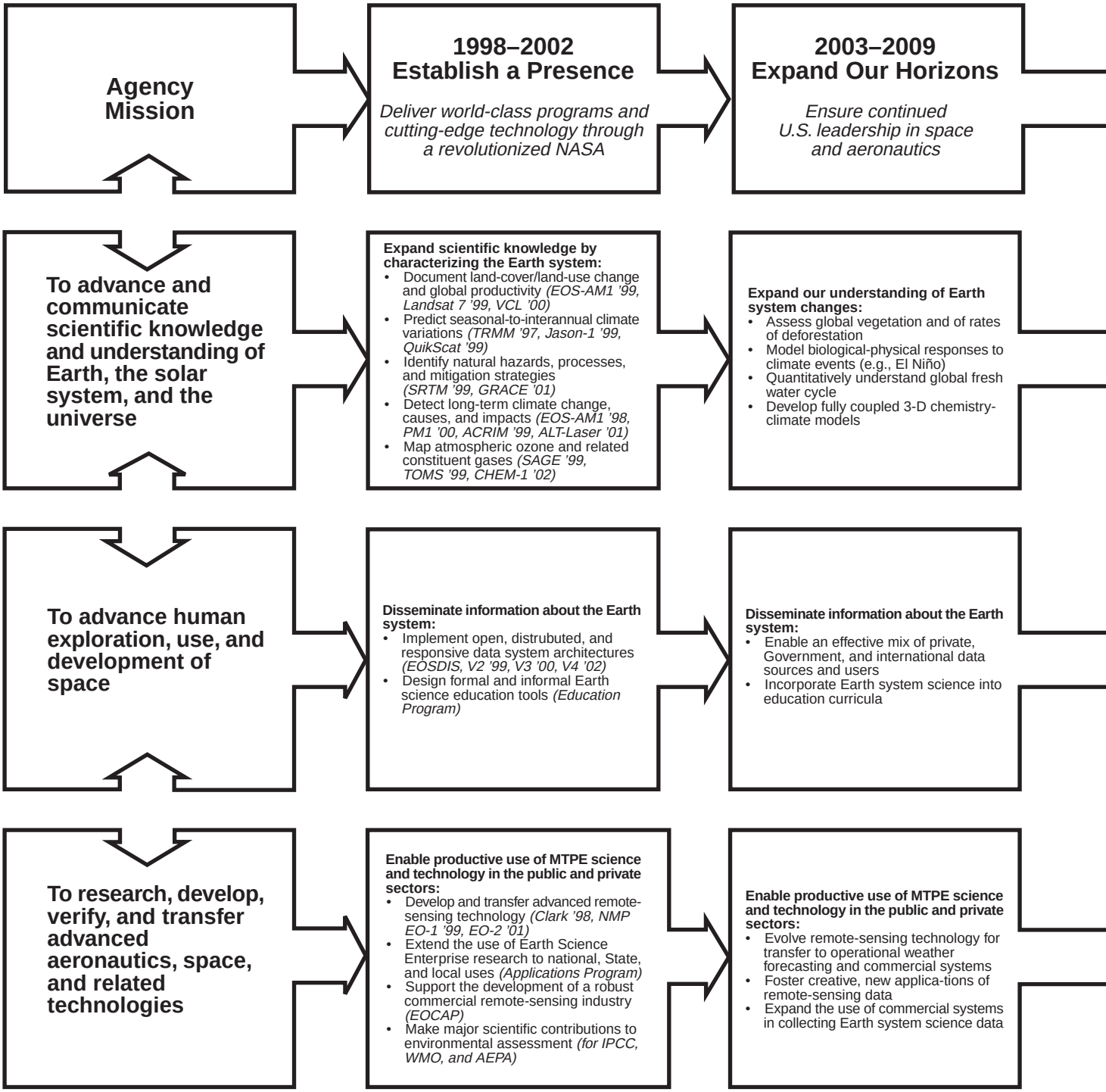
The Enterprise is responsible for technology development needed for the next generation of Earth remote-sensing systems and is defining a science-driven strategy to guide technology investment choices. Participation in the New Millennium program is one example of the Enterprise's technology



This image of Hurricane Fran was taken from the NOAA/National Weather Service's GOES-8 (Geostationary Operational Environmental Satellite) on September 4, 1996, at 1:15 p.m. EDT, less than 7 hours before the eye went ashore at Cape Fear, North Carolina. The image was enhanced and rendered at NASA's Goddard Space Flight Center, Laboratory for Atmosphere, Greenbelt, Maryland.

investment approach. In the near term, technology investments will be driven by the need for smaller, less expensive instruments to continue the EOS first series measurements and to enable key new measurement capabilities such as Light Intersection Direction and Ranging (LIDAR) for atmospheric winds. Highly distributed, advanced Internet capabilities must be developed to enable the widespread application of environmental data. In the midterm, new measurement and modeling capabilities will be pursued to enable the three-dimensional characterization of Earth's atmosphere

NASA's ER-2 is the country's premier high-altitude civilian research aircraft. Flying in the lower stratosphere, it allows scientists to make in situ measurements for the study of atmospheric chemistry, such as ozone breakdown. It also serves as a testbed for instruments planned for future Earth-orbiting spacecraft.



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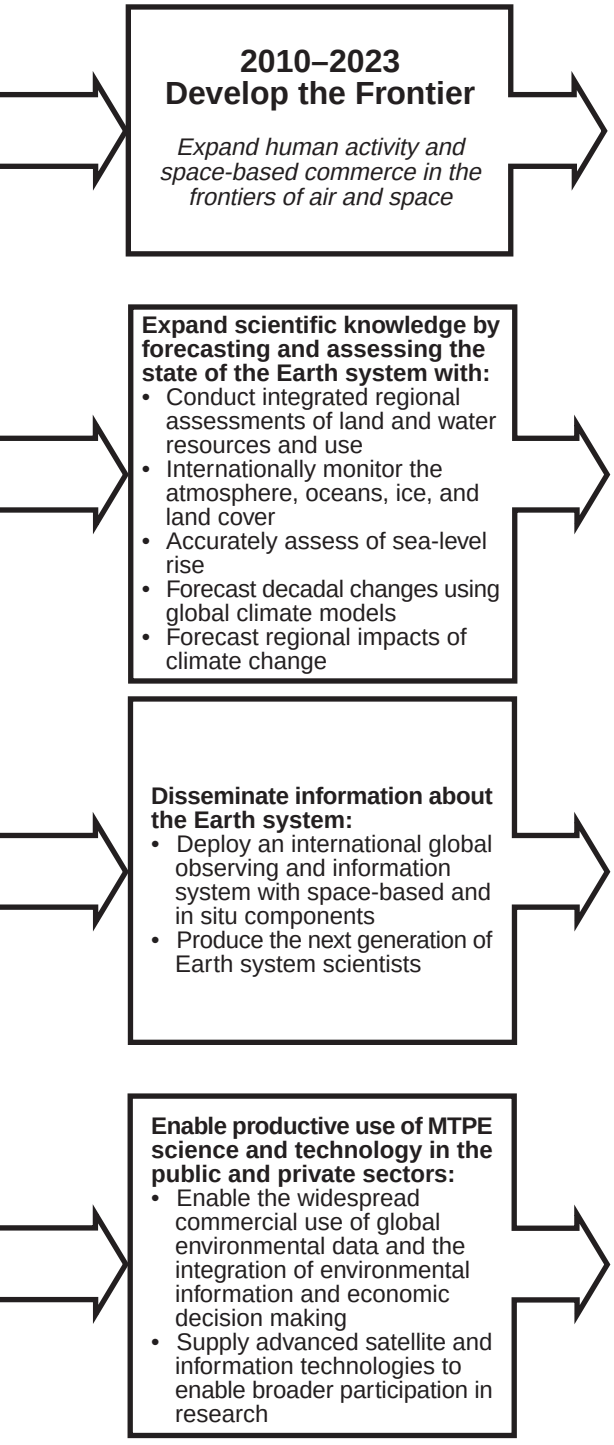


and ecosystems. Supercomputing initiatives will allow for large-scale modeling and visualization to advance weather prediction and forecasting of seasonal phenomena, such as El Niño and the resulting impacts on a regional level. In the long term, sensor concepts and spacecraft systems technologies will be advanced to cost-effectively support the transition of measurements to operational systems. Capacity and performance improvements in information systems technologies will be developed to enable coupled climate models for change prediction and to improve weather forecasts over all time scales.

The ultimate beneficiaries of Earth Science are the present and future generations of the people on Earth. The primary customers are researchers seeking answers to key Earth science questions, commercial firms using Earth Science data and technology to help their businesses grow, public sector managers exercising stewardship of our natural resources, and educators teaching the next generation of scientists, engineers, and citizens. The Earth Science Enterprise and its partners provide a sound, scientific foundation for public and private sector choices on the road to sustainable development.

Roles and Responsibilities

The NASA Centers' primary missions to support the Earth Science Enterprise are listed in the table below.

Center	Mission
Goddard Space Flight Center **Jet Propulsion Laboratory** **Langley Research Center** **Stennis Space Center**	Earth System Science Instrument Technology Atmospheric Science Commercial Remote Sensing

Human Exploration and Development of Space Enterprise

Mission

We seek to bring the frontier of space fully within the sphere of human activity to build a better future for all humankind. Imagine new products based on space research, such as high-quality protein crystals to allow the design of new drugs for treating disease. Envision school children learning their lessons by telepresence instruction from the Moon. Imagine commerce flourishing in space, with solar power satellites, or a Martian powerplant to permit a permanent colony. These images are part of the Human Exploration and Development of Space (HEDS) Enterprise. The mission of the Enterprise is to open the space frontier by exploring, using, and enabling the development of space and to expand the human experience into the far reaches of space.

In exploring space, HEDS brings people and machines together to overcome challenges of distance, time, and environment. Robotic science missions survey and characterize other bodies as precursors to eventual human missions. The Space Shuttle and International Space Station (ISS) serve as research platforms to pave the way for sustained human presence in space through critical research on human adaptation. These programs also provide opportunities for research with applications on Earth. HEDS serves as a catalyst for commercial space development. We will employ breakthrough technologies to revolutionize human space flight.

Phase I of the International Space Station includes nine docking missions by the Space Shuttle to the Russian Mir *space station.*

Questions to Address

HEDS pursues the answers to myriad research and engineering questions that must be answered as we learn to live and work in space. HEDS plays an important role in pursuing answers to the questions: What is the fundamental role of gravity and cosmic radiation in vital biological, physical, and chemical systems in space, on other planetary bodies, and on Earth, and how do we apply this fundamental knowledge to the establishment of permanent human presence in space to improve life on Earth? HEDS also plays an important role working with the other Enterprises to pursue answers to other fundamental questions, including: Does life exist elsewhere than on our planet?

Goals

The goals of the HEDS Enterprise are as follows:

- Expand the space frontier;
- Expand scientific knowledge;
- Enable and establish a permanent and productive human presence in Earth orbit;
- Expand the commercial development of space; and
- Share the experience and discovery of human space flight.

Strategies and Outcomes

The programs of NASA's HEDS respond to the goals of the National Space Policy. Under the direction of the policy, HEDS focuses its research and developments in "space science to enhance knowledge of . . . fundamental natural and physical sciences; . . . [and] human space flight to conduct scientific, commercial, and exploration activities. . . ."

The Enterprise will contribute new scientific knowledge by studying the effects of gravity and the space environment on important biological, chemical, and physical processes. This knowledge will provide fundamental insights for new Earth-bound applications and technology. We will continue to develop biomedical knowledge and technology to allow people to thrive physically and psychologically while exploring and opening the space frontier.

The Enterprise relies on the robotic missions of the Space Science Enterprise to provide extensive knowledge of the geology, environment, and resources of planetary bodies. The Space Science Enterprise missions will also demonstrate the feasibility of utilizing local resources to "live off the land."

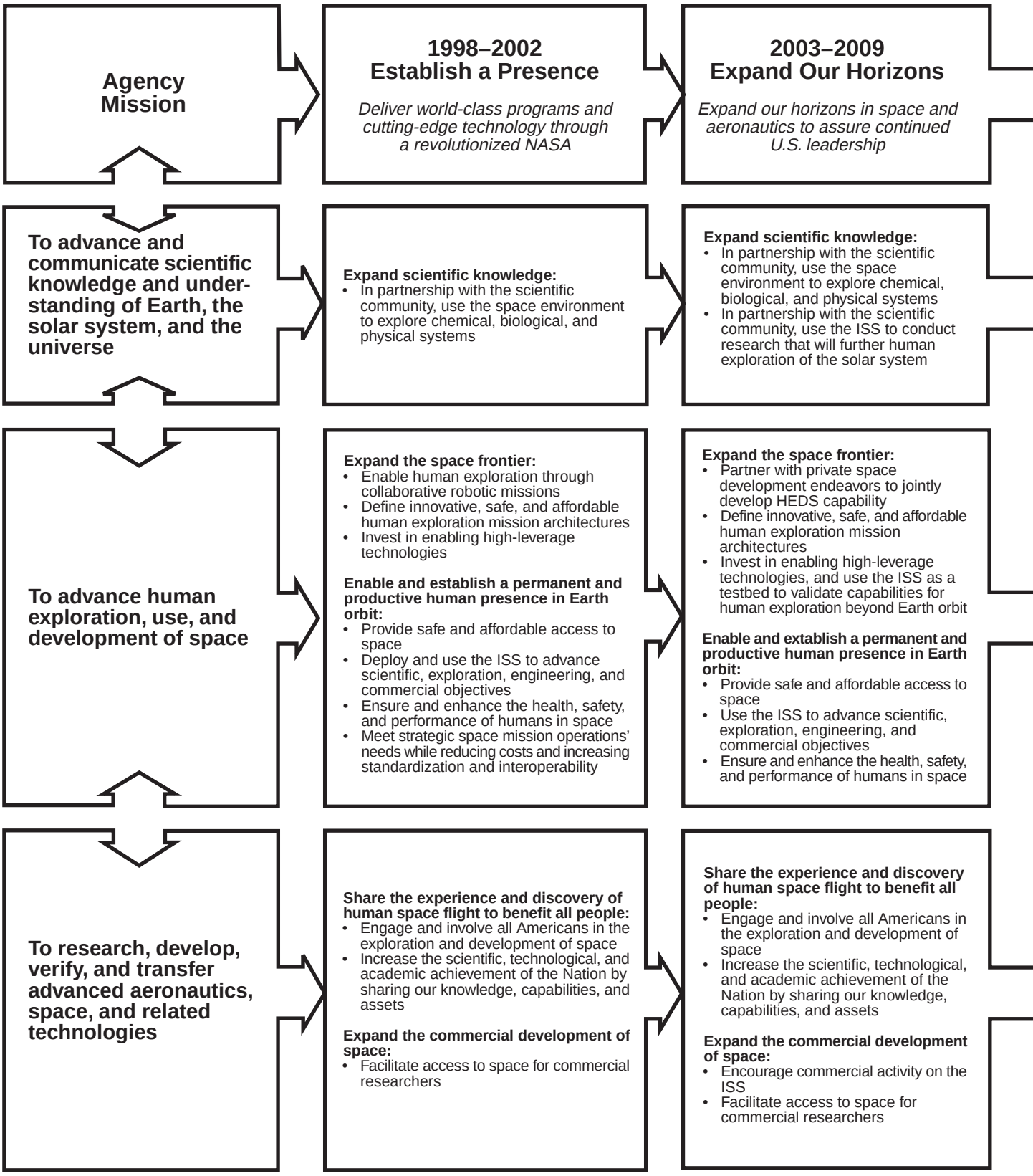
Pursuant to the National Space Policy, HEDS will develop and operate the ISS to support activities requiring the unique attributes of humans in space and establish a permanent human presence in Earth orbit. The ISS will support future decisions on the feasibility and desirability of conducting further human exploration activities. The ISS will be the largest multinational science and engineering program in history and will vastly expand the human experience of living and working in space. This long-duration laboratory will provide unprecedented opportunities for science, technology, engineering, and commercial investigations in the space environment.

HEDS will seek out synergies between commercial capabilities and Government needs. HEDS will also join with the private sector to stimulate opportunities for commercial development in space as a key to future settlement. Near-term efforts will emphasize joint pilot projects that provide clear benefit to Earth from the development of near-Earth space, while the long-term emphasis will be on the use of resources and environments of planetary bodies for the benefit of humankind and to sustain a human presence beyond Earth.

Artist's concept of a potential Mars mission. Here, the crew has connected two habitats together to conduct a variety of surface exploration activities.

Safe, reliable, low-cost transportation is critical to the goals of the HEDS Enterprise. The National Space Policy directs the Agency to ensure safety on all space flight missions involving the Space Shuttle and the ISS. The Space Shuttle program is committed to flying safely, meeting the manifest, improving system supportability and reliability, and reducing cost—in that order of priority. HEDS will provide space operations management and communications services through commercial means while setting the stage for future investments that will be required as we explore the solar system and beyond. Per the National Space Policy, HEDS will seek to privatize or commercialize NASA's space communications operations no later than 2005.

HEDS will pursue technology development in support of its near-, mid-, and long-term objectives. In the near term, HEDS will develop state-of-the-art research facilities for the ISS while infusing technologies to improve ISS performance. Technologies in development include microelectronic sensors for monitoring the ISS atmosphere at reduced requirements for power and crew time, biological water processing to reduce resupply requirements, advanced carbon dioxide removal systems that use specially designed, regenerable chemicals, and other



The Roadmap presents the overall goals (presented in bold), objectives (presented as bullets), and major program milestones and related activities (presented in parentheses and italics) for the Enterprise.

2010–2023 & Beyond
Develop the Frontiers

Expand human activity and space-based commerce in the frontiers of air and space

Expand scientific knowledge:
- In partnership with the Space Science Enterprise, use human capability to extend scientific discovery on missions of exploration

Conduct human missions to planetary and other bodies in our solar system

Demonstrate new systems and capabilities to enable U.S. industry to develop new, profitable space industries

technologies. Space Shuttle management has identified a need for changes that will improve the program's supportability, reduce operating costs, improve cycle times, and ensure Shuttle viability. Phase I upgrades, such as the alternate turbopumps, large throat main combustion chamber, and improved powerhead for the Space Shuttle Main Engine, are currently under way. Near-term Phase II upgrades include the Global Positioning System and the replacement of Shuttle control room systems. In the midterm, HEDS will use the ISS to open space for exploration by developing advanced technologies to sustain humans on missions of exploration at reduced costs. We will develop revolutionary advanced technologies that will support future national decisions regarding human missions beyond Earth orbit. HEDS will develop the technologies to close the life-support loop for air and water, control the effects of the space environment on human health, and deliver health support and care at remote distances. Candidate midterm technologies for the Space Shuttle include some major upgrades, such as improving the Shuttle avionics system with state-of-the-art electronics or replacing the Reaction Control System and Auxiliary Power Units with systems that use nontoxic fuels.

In the long term, HEDS technology will enable affordable, extended exploration of the solar system and operations in space. Key technologies will include in situ resupply or recycling of all consumables, including food, air, water, and propellants. HEDS will develop advanced screening and health care delivery, as well as effective control over the physiological effects of transitions among a variety of gravity and radiation environments through many different durations. Major improvements to the Space Shuttle are under consideration. HEDS will develop revolutionary new advanced transportation concepts for accommodating humans, including travel to distant destinations. HEDS will work with NASA's Aero-Space Technology Enterprise to develop technology for affordable transportation to, in, and beyond Earth orbit.

Roles and Responsibilities

The NASA Centers' primary missions to support the HEDS Enterprise are listed in the table below.

Center	Mission
Ames Research Center	Astrobiology
Johnson Space Center	Human Exploration and Astro Materials
Kennedy Space Center	Space Launch
Marshall Space Flight Center	Space Transportation Systems and Microgravity Research
Stennis Space Center	Rocket Propulsion Testing

Aero-Space Technology Enterprise

Mission

Research and technology play a vital role in ensuring the safety, environmental compatibility, and productivity of the air transportation system and in enhancing the economic health and national security of the Nation. However, numerous factors, including growth in air traffic, increasingly demanding international environmental standards, an aging aircraft fleet, aggressive foreign competition, and launch costs that impede affordable access and utilization of space, represent formidable challenges to the Nation.

The mission of this Enterprise is to pioneer the identification, development, verification, transfer, application, and commercialization of high-payoff aeronautics and space transportation technologies. Through its research and technology accomplishments, it promotes economic growth and national security through a safe, efficient national aviation system and affordable, reliable space transportation. The plans and goals of this Enterprise directly support national policy in both aeronautics and space, documented in "Goals for a National Partnership in Aeronautics Research and Technology" and "National Space Transportation Policy." This Enterprise works in alliance with its aeronautics and space transportation customers, including U.S. industry, the university community, the Department of Defense (DoD), the Federal Aviation Administration (FAA), and the other NASA Enterprises, to ensure that national investments in aero-space technology are effectively defined and coordinated and that NASA's technology products and services add value, are timely, and have been developed to the level at which the customer can confidently make decisions regarding the application of those technologies.

The Enterprise also has Agency responsibility for technology transfer and commercialization. This function is provided as an Agency-wide service to ensure wide, rapid transfer of NASA-developed technologies to U.S. industry for the social and economic benefit of all U.S. citizens.

Questions to Address

The Aero-Space Technology Enterprise is responsible for answering the question: How do we enable revolutionary technological advances that provide air and space travel for anyone, anytime, anywhere more safely, more affordably, and with less impact on the environment and improve business opportunities and global security?

Goals

The Enterprise has three major technology goals supported by ten enabling technology objectives (detailed in the Enterprise Roadmap) and a service goal.

Technology Goals

Global Civil Aviation—Develop an environmentally friendly global air transportation system for the next century of unquestioned safety that improves the Nation's mobility.

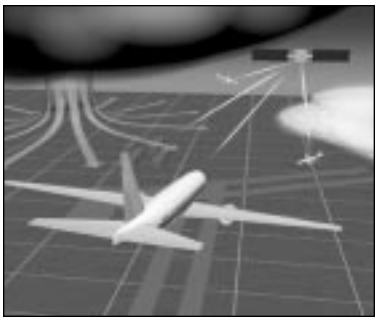
Revolutionary Technology Leaps—Revolutionize air travel and the way in which air and space vehicles are designed, built, and operated.

Space Transportation—Achieve the full potential of space for all human endeavor through affordable space transportation.

Service Goal

Research and Development (R&D) Services—Enable, and as appropriate provide, on a national basis, world-class aerospace R&D services, including facilities and expertise.

Alliances—Create alliances with industry to develop technology systems and transfer NASA technology.



The three major pillars—Global Civil Aviation, Revolutionary Technology Leaps, and Access to Space.

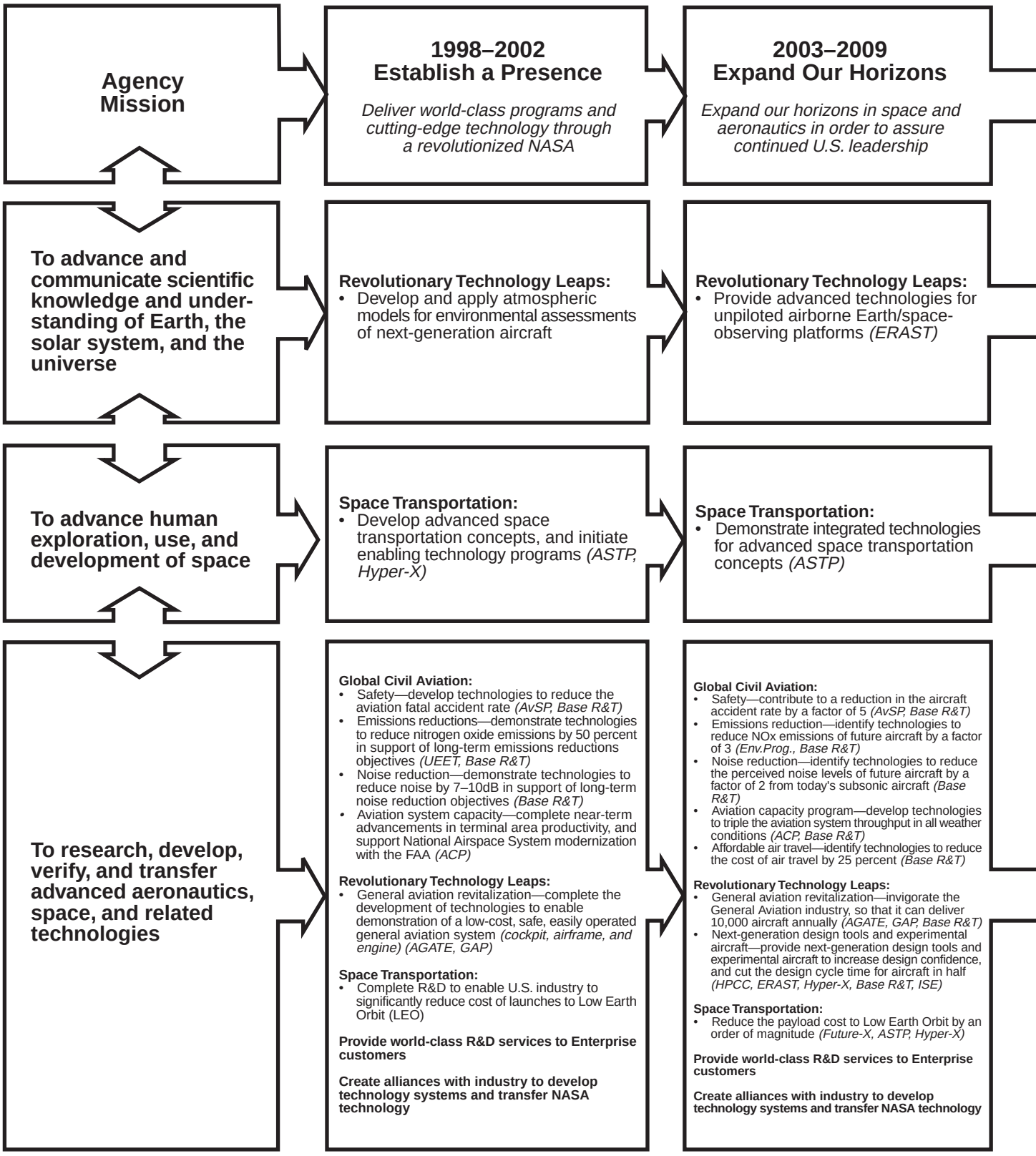
Strategies and Outcomes

To help achieve these goals, the Enterprise has restructured its research program and management processes. We include our customers and stakeholders from the beginning of our strategic planning process through program definition, implementation, and evaluation. Enterprise leadership manages a clearly defined portfolio of technology investments to ensure alignment with national needs and support of the Enterprise and Agency strategy. The Enterprise has clearly designated Lead Centers for the implementation of the technology programs.

The technology objectives of the Enterprise are outcome focused and "stretch" beyond our current knowledge base. Although we do not know in advance how to achieve the goals and objectives, the development of investment strategies is issue driven. Investments are focused on the critical issues associated with the goals and objectives where technology can be a determining factor. This requires the analysis of current as well as future issues. In other words, to achieve 10- or 20-year goals, the Enterprise must not only address current issues associated with a goal, but also seek to anticipate and address issues associated with future aviation and space systems. For example, to achieve a reduction in the aircraft accident rate, the Enterprise must address not only issues that are currently causing accidents, but issues that might cause accidents in the future, such as digital information integrity. The result of this process is the development of roadmaps to guide program development and metrics to measure program success.

The outcome-focused nature of the goals and objectives project the end-state within the air and space transportation systems. However, the Enterprise does not control the air and space transportation systems. Manufacturers, airlines, general aviation operators, space transportation operators, the FAA, and DoD are some of the primary organizations that ultimately implement the technologies and systems that will achieve the goals. Therefore, the goals provide a constant driver for the Enterprise to work in partnership with our customers to ensure the technologies that are developed are the right technologies, at the right time, and the right level of maturity in order to maximize the probability of implementation. A principal strategy of the Enterprise is to create alliances and work in partnership in every aspect of planning, implementation, and evaluation.

Both the Enterprise's Base R&T and Systems Technology programs are focused on achieving the goals and objectives by working to the same roadmaps and metrics. The character of the Base R&T program will be to maintain a broader set of technology investments and to specifically target



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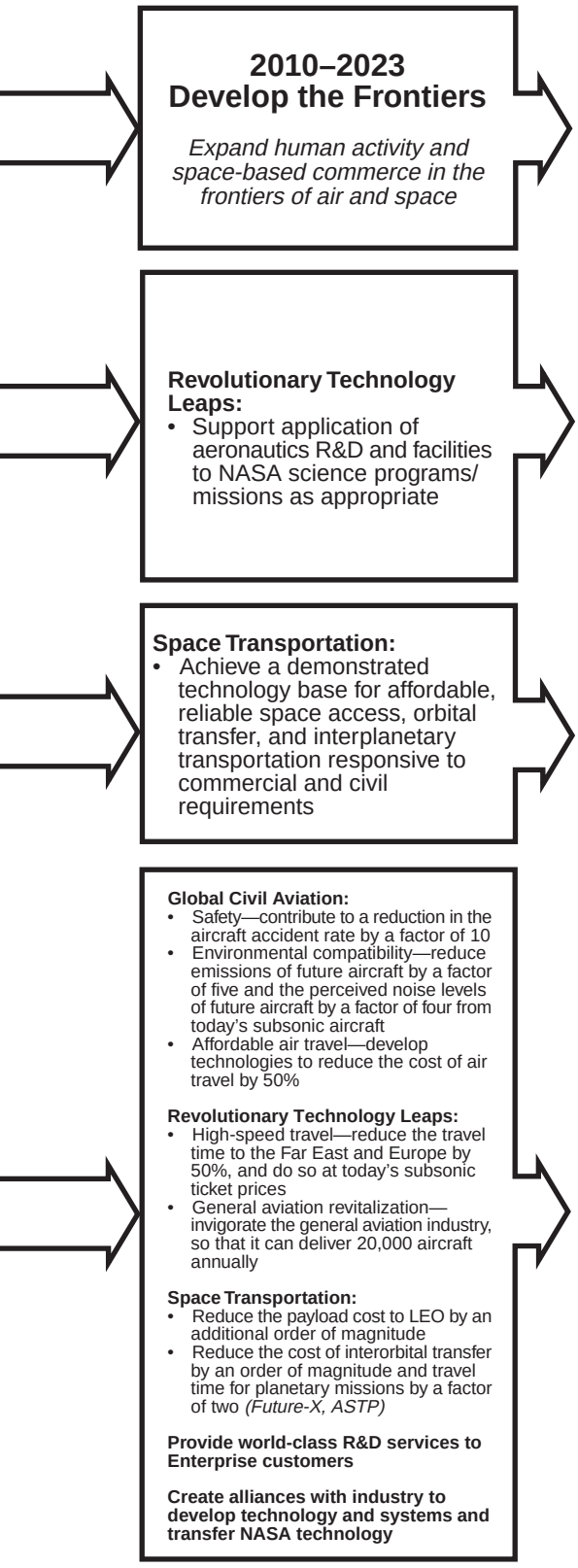

fundamental and barrier issues. Base R&T elements will: (1) support the maturation of technology to a level that it can be confidently integrated into a Systems Technology program; (2) directly transfer technology to the external customer community as appropriate; and (3) provide the basis for new Systems Technology programs. The character of the Systems Technology programs will be to specifically target an integrated set of technologies that advance the goal/objective metrics and can be confidently developed and advanced to a level of maturity sufficient for transfer and adoption by the external customer community.

Roles and Responsibilities

The NASA Centers' primary missions to support the Aero-Space Technology Enterprise are listed in the table below.

Center	Mission
Ames Research Center	Aviation Operation Systems
Dryden Flight Research Center	Flight Research
Langley Research Center	Airframe Systems
Glenn Research Center	Aeropropulsion
Marshall Space Flight Center	Space Transportation Systems
Stennis Space Center	Rocket Propulsion Testing

Synergy Within NASA and With Our Partners

The Strategic Enterprises comprise an integrated national aeronautics and space program. A synergy of broad purposes, technology requirements, workforce skills, facilities, and many other dimensions was the basis for amalgamating these activities in NASA through the Space Act. The benefits of this synergy remain strong today.

Internal Synergy

The Space Science Enterprise works in partnership with the Human Exploration and Development of Space (HEDS) Enterprise to provide information essential to further human exploration and development of the solar system. This includes scientific information about likely human destinations such as the Moon and Mars, surveys and characterizations of space resources, and an evaluation of space radiation hazards. The partnership with HEDS also involves using Space Science Enterprise missions to test human exploration technologies in space and planetary environments. HEDS, in turn, provides Space Science with opportunities to conduct research. For example, Space Science flies payloads on the Space Shuttle, such as telescopes to study the ultraviolet universe, instruments to study the solar corona and the origin of the solar wind, and cosmic dust collection experiments. The International Space Station will provide further opportunities for these and other types of investigations. Ultimately, some of the most important and complex science goals, such as answering the question "Did life ever arise on Mars?," may need to be addressed by human explorers. Indeed, answering questions of this magnitude may well prove to be a significant part of the rationale for human exploration. Therefore, the synergy between these two Enterprises is strong—and certainly essential to the long-range success of both.

The Aero-Space Technology (AST) Enterprise makes important contributions to the Space Science, Earth Science, and HEDS Enterprises. For example, Space Science and Earth Science have long taken advantage of the AST Enterprise's expertise to design and build atmospheric entry probes for solar system exploration missions and Earth observation systems. Aero-acoustics and aerodynamics expertise has also been vital in preparing for the Stratospheric Observatory for Infrared Astronomy (SOFIA) program. Another example, AST's High Performance Computing and Communications (HPCC) program, provides the space science community with access to the most advanced computational technology, which furthers both research and the sharing of results with educators and the public. Earth Science, in turn, provides AST with assessments of the atmospheric effects of aircraft emissions. The HEDS and Space Science Enterprises will take advantage of the new launch technologies to be provided by the AST Enterprise.

The Space Science Enterprise enriches the Earth Science Enterprise through studies of the Sun, the near-Earth space environment, Earth's middle and upper atmosphere, and other planets. For example, variations in solar radiation and particle emission cause variations in Earth's atmosphere, providing us with a better understanding of our terrestrial environment. The study of other planets, particularly Venus and Mars, provide an important context for understanding why Earth is capable of sustaining life and how some of the processes involved in global change behave in other planetary settings. Ultimately, this better understanding of our home

environment sought by Earth Science may help us create environments that can sustain humans on other worlds.

Synergies also exist among our Crosscutting Processes. For example, the Manage Strategically process provides information to the other processes regarding the requirements and mandates of NASA's external customers and stakeholders. This information is used to determine what knowledge to generate, what aerospace products and services are needed to meet national goals in science and technology, and what knowledge must be communicated to whom. The Generate Knowledge process provides scientific results and discoveries to the Communicate Knowledge process, which disseminates this information widely in a format that is understandable by a broad audience.

External Partnerships and Cooperation

To encourage improved efficiencies for our human and capital resources, we are also developing synergies between the programs of the Enterprises and the capabilities of other partners in Government, industry, academia, and other nations.

The Earth Science Enterprise is NASA's contribution to the U.S. Global Change Research Program, in which our research and observational priorities are coordinated with 11 other Federal agencies. NASA contributes the space-based observing capability and the analysis of remote-sensing data essential for global and regional-scale studies. Partner agencies, such as the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS), perform the bulk of the surface-based observations and analyses, and mission agencies, such as the U.S. Department of Agriculture and the Environmental Protection Agency, focus the partners on regional uses of research results. NASA and NOAA are building an integrated program of research on the El Niño-Southern Oscillation phenomenon. NASA, NOAA, and the Department of Defense (DoD) have formed the Integrated Program Office for the development of the National Polar-orbiting Operational Environmental Satellite System (NPOESS)—the next-generation U.S. weather satellites in polar orbit. NASA, NOAA, and USGS are collaborating on the Landsat 7 program, and NASA, DoD, and USGS are planning a Shuttle-based synthetic aperture radar mission to meet all three agencies' requirements for a digital terrain model of Earth's surface. NASA and the Department of Agriculture are cooperating on land-cover and land-use change research. We are also collaborating with the Federal Emergency Management Agency to conduct natural hazards research and applications.

The Space Science Enterprise vigorously pursues opportunities to collaborate with other Government agencies about the origin, evolution, and destiny of the cosmos and life. Chief among these are the National Science Foundation, the Department of Energy (DOE), and DoD. Among other activities, the National Science Foundation and NASA collaborate with the Smithsonian Institution in the search, collection, distribution, and curation of Antarctic meteorites. DOE and NASA have partnered in the provision of radioisotope thermoelectric generators for the Galileo and Cassini spacecraft. Through its Los Alamos and Lawrence Livermore Laboratories, DOE has also contributed greatly to the development of instruments and sensors needed for several space science missions. DoD has been a major developer of high-sensitivity, large-area infrared detector arrays. In addition, recently declassified critical technology for large-area deployable optical systems will be of vital importance for future large telescopes in space. The Space Science

Enterprise, in turn, contributes to some DoD objectives—for example, research on solar flares, coronal mass ejections, solar energetic particles, and the terrestrial middle/upper atmosphere and magnetosphere is important for DoD command, control, and communications systems. The Enterprise meets with the National Science Foundation (NSF) at the discipline level on a periodic basis for program coordination. Consultations with NSF have led to the coordination of NASA and NSF support for research relevant for the Enterprise's Origins initiative and to the agreement that NASA will support space-based astronomical observations while NSF will be primarily responsible for supporting ground-based research.

NASA's HEDS Enterprise conducts a broad range of consultations with other Federal agencies as a routine element of planning and program development. HEDS enters into numerous memoranda of agreement and understanding with other Federal agencies, sponsors and attends many workshops and symposia organized around themes common to multiple Federal agencies, and participates in regular meetings of various coordinating bodies. Our primary partner agencies and departments are the National Institutes of Health (NIH), NSF, DoD (including work specific to the Defense Advanced Research Projects Office, the U.S. Air Force, the Office of Naval Research, and other DoD organizations), and the Department of Energy.

HEDS has established more than 20 cooperative agreements with NIH, including 18 memoranda of understanding. Cooperation with the NIH includes joint workshops on scientific topics of mutual interest, jointly funded projects, a highly successful effort in technology transfer of advanced cell culturing technology, and cooperative flight experiments. The National Science Foundation is a partner in Neurolab, an upcoming Space Shuttle/Spacelab mission dedicated to research on the nervous system. HEDS and the National Science Foundation have held cooperative discussions on nanotechnology, as well as biomedical technology and bioengineering.

Areas of cooperation with the Department of Energy include the use of ground-based facilities for simulating and studying the effects of space radiation, cooperation on studies on the biological effects of radiation, and cooperation on a fundamental physics experiment facility for the International Space Station. HEDS and the Department of Energy cooperated very closely on the development and flight of the Alpha Magnetic Spectrometer, which searches for evidence of antimatter in Earth orbit.

Under a memorandum of agreement between NASA and DoD, an Aeronautics and Astronautics Coordinating Board oversees coordination on such HEDS activities as Multi-Service Launch System use for NASA near-term missions; Titan II use for NASA near-term missions; DoD use of the Shuttle as a primary dedicated DoD launch system; combined program office/single procurement for Expendable Launch Vehicles; Evolved Expendable Launch Vehicle (EELV) to Reusable Launch Vehicle transition criteria and approach; NASA use of the EELV when operational; compatibility of NASA/NOAA satellites on the DoD network and vice versa; ability of the Tracking and Data Relay Satellite System (TDRSS) constellation to support DoD and NOAA satellites for the near and midterms; and transition of NASA satellite control operations to DoD. HEDS and the Department of Defense have held discussions on the provision of health care in extreme environments, and HEDS and the Armed Forces Radiobiology Research

Institute cooperate on radiation biology studies of mutual interest.

AST works in alliance with its aeronautics and space transportation customers in industry, in the university community, and through several bilateral and trilateral relationships with DoD and the FAA. For example, the NASA-FAA Coordinating Committee provides for cooperative national programs in aviation safety, airspace operations, and environmental compatibility. The NASA-DoD Aeronautics and Astronautics Coordinating Board has fostered interagency planning for programs such as rotocraft and human factors research. The Board also is addressing cooperative activities for the National Aeronautics Testing Alliance. Another example of interagency planning is the Integrated Plan for Air Traffic Management Research and Technology Development produced by a NASA-FAA integrated product team.

Each interagency program includes regular consultations among the participating agencies to identify shared goals and objectives, collaborations, and interdependencies. As part of this process, we are working to identify common metrics and success criteria for each major milestone of the interagency programs.

NASA has also developed extensive alliances with its partners in other Government agencies to improve efficiencies for our human and capital resources, leverage unique capabilities, and reduce potential functional duplications. As a member of the National Science and Technology Council, which was established by the President in 1993, NASA participates in the planning of the diverse research and development initiatives of the Federal Government and the coordination of strategies for achieving shared goals and objectives. We have also worked closely with the Office of Science and Technology Policy, as well as agencies supporting space research and development to implement the President's National Space Policy and Goals for a National Partnership in Aeronautics Research and Technology. NASA obtains substantial procurement and contract administration services from DoD rather than duplicating these capabilities. We also cooperate with DoD and the General Services Administration in developing and maintaining the uniform Federal regulation governing acquisition. In addition, NASA relies on the Department of the Treasury for processing payments to contractors, and the Agency utilizes and supports the Justice Department in criminal investigations.

International cooperation is a key element of the strategies for all four Strategic Enterprises. NASA seeks cooperation of mutual benefit with its foreign partners. Through this cooperation, global issues are addressed on a global basis. International cooperation helps meet NASA's goals and objectives by adding unique capabilities or expertise, increasing mission flight opportunities, providing access to locations outside the United States, and enhancing the scientific return. It also allows nations to share the cost of implementing space and aeronautics programs. For example, the Space Science Enterprise has cooperatively established an International Mars Exploration Working Group to coordinate planning for robotic Mars exploration; discussions are under way to include European-provided communications components as critical elements of future missions in NASA's Mars Surveyor program. NASA has extensive cooperation with Canada, Europe, Japan, and Russia. NASA also has expanding cooperation with developing spacefaring nations. NASA is working with other nations to identify new opportunities for cooperation consistent with the goals of the Agency.

NASA's Crosscutting Processes

NASA is making significant progress in achieving our mission and goals by doing business faster, better, and cheaper while never compromising safety. Throughout the Agency, there are hundreds of examples of programs, projects, and management systems being delivered with better service and at lower costs. The Clinton Administration's "Reinvention Marching Orders," to deliver great customer service, foster partnerships and community solutions, and reinvent government to get the job done with less, and the principles of the Government Performance and Results Act guide our strategies to revolutionize the Agency. Four Crosscutting Processes have been established to support all Agency activities and Enterprises. The top-level goals, objectives, and strategies for the processes are described below.

Manage Strategically

This process provides policy, direction, and implementation guidelines to NASA's organizational elements and employees that enable the Agency to develop, conduct, and evaluate programs to achieve the Nation's goals in aeronautics and space.

The goal of this process is to ensure that the Agency carries out its responsibilities effectively and safely and that management makes critical decisions regarding implementation activities and resource allocations that support NASA's strategic, implementation, and performance plans.

The process objectives are as follows:

- Align Agency direction and deployment decisions with external mandates and the requirements of our customers, partners, and stakeholders;
- Assess, document, communicate, and mitigate the programmatic and technical risks associated with NASA programs and projects (to support informed, timely, and effective decisionmaking processes throughout the life cycle). Focus special attention toward addressing and mitigating safety and health risks presented by our work environment and our projects.
- Communicate Agency direction and decisions throughout the NASA Team and to the external community in a timely, consistent, and understandable manner;
- Optimize Agency investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations;
- Improve the effectiveness and efficiency of Agency acquisitions through the increased use of techniques and management that enhance contractor innovation and performance;
- Ensure that information technology provides an open and secure exchange of information, is consistent with Agency technical architectures and standards, demonstrates a projected return on investment, reduces risk, and directly contributes to mission success; and
- Foster leadership that demonstrates a commitment to the Agency's values, principles, goals, and objectives.

To achieve the goal and objectives for this process:

- **We will measure our performance and communicate our results, demonstrating NASA's relevance and contributions to national needs.** NASA's performance in developing and delivering products and services is evaluated at Agency, Strategic Enterprise, Functional/Staff Office, program or project, Crosscutting Process, and individual levels. Each level has responsibility to execute the requirements and to measure,

evaluate, and report the results. As each part of the organization completes its measurement process, data are used to validate that performance meets or exceeds planned goals, objectives, and performance targets. In those situations where performance does not meet the plan, opportunities for continuous improvement and reengineering are identified.

On a semiannual basis, NASA's Senior Management Council will review performance against the goals and objectives contained in this Plan, the Enterprise Strategic Plans, and the Annual Performance Plan. These reviews will take place in March and September of each year. To assess progress in meeting the Agency's general goals, we will review performance goals and measures that relate to the near-term objectives of our Enterprises and of our Crosscutting Processes. Examples of the relationships between Agency goals and performance goals include:

– Reducing development cycle time and cost and increasing launch rates for NASA spacecraft. This relates to the Agency goals to develop lower cost missions to characterize the Earth system and chart the evolution of the universe and solar system and to improve Shuttle safety and efficiency;
– Increasing the accessibility and use of science and research data. This addresses NASA's goals to characterize the Earth system and chart the evolution of the universe and solar system, to explore nature's processes in space, and to facilitate and stimulate the productive use of science and technology in the public and private sectors; and
– Increasing leverage of NASA's research and development investments in commercial partnerships with industry. This relates to our goals to develop new technologies and processes to enhance research and make aeronautics and space programs more affordable and to develop affordable technologies for U.S. leadership in aviation growth markets.

These measures will be included in the Agency's Annual Performance Plan and associated Performance Report. (Appendix 2 provides a summary of Enterprise and Crosscutting Process objectives and associated measures.)

At the program level, NASA's Program Management Council will continue to conduct reviews prior to initiation and throughout a program's life to confirm compliance with cost, schedule, and performance targets. In addition, NASA's Capital Investment Council will continually reaffirm that our investment decisions support overall program and institutional goals and that outcomes remain relevant and provide valuable contributions to the Nation's needs. To effectively manage our financial resources and evaluate Agency, Enterprise, and program-level performance, NASA is developing and implementing a new integrated financial management system. The integration of this system, and other initiatives such as full-cost accounting, will enable performance improvements to our financial and resource management.

NASA maintains a broad and diverse system of advisory committees under the Federal Advisory Committee Act, which includes the Aerospace Safety Advisory Panel and the NASA Advisory Council, its 7 standing committees, 20 standing subcommittees, and various task forces. The Agency extensively uses these advisory committees to obtain external input to its strategic and performance plans as well as to evaluate Agency performance.

NASA also relies on external organizations to assess our ability to achieve goals and objectives. These reviews are conducted by such entities as the National Academy of Sciences, the General Accounting Office, the Occupational Safety and Health Administration, and the Environmental Protection Agency. Reviews are also conducted by the NASA Office of the Inspector General.

- **We will change the way we work with our contractors and streamline regulations.**
  Through the implementation of Performance Based Contracting and other initiatives, we will assign a higher level of integration responsibility and accountability to our contractors. By moving NASA civil service employees from detailed operations management to contract oversight roles, we will enable the aerospace business, not direct it. We will fully integrate small, small disadvantaged, and women-owned businesses into the competitive base from which we purchase goods and services, urging prime contractors to forge permanent, mutually beneficial business relationships with small firms. As a result, we seek to enable these businesses to mature and play an increasing role in the economic growth within their communities.

  We will propose reporting and regulatory changes to ease the transition to a new way of doing business. We will continue to reduce the number of internal regulations and policy documents, administrative costs, and functional overlaps.

- **We will deliver on our commitments, be accountable for the success of our programs, and provide a balanced and stable aeronautics and space program by implementing strategic management throughout NASA.**

  We are committed to managing through our strategic and implementation plans at all levels with a focus on relevant results for our customers. We will develop and retain the proper skill mix necessary to remain the recognized leader in aeronautics and aerospace. We will empower employees to perform their jobs and supervisors to manage, while holding all accountable for fulfilling their responsibilities. Above all, we will protect the safety and health of the general public and the NASA and contractor workforce. To ensure the alignment of individual activities with the goals of the strategic and implementation plans, performance plans will be developed to outline the contributions of each employee.

  We will ensure that our budget process, implementation planning, and deployment are tied to our strategic plans. We will manage effectively and efficiently, recognizing political and budgetary realities. We will work closely with our customers and stakeholders to develop long-term requirements and outcomes that will take us well into the next millennium.

Provide Aerospace Products and Capabilities

This process is the means by which NASA's Strategic Enterprises and their Centers deliver systems (aeronautics, space, and ground), technologies, data, and operational services to NASA customers so they can conduct research, explore and develop space, and improve life on Earth. The Agency uses the process to answer fundamental questions: What cutting-edge technologies, processes, techniques, and engineering capabilities must we develop to enable our research agenda in the most productive, economical, and timely manner? How can we most effectively transfer the

knowledge we gain from our research and discoveries to commercial ventures in the air, in space, and on Earth?

The goal of the process is to enable NASA's Strategic Enterprises and their Centers to deliver products and services to customers more effectively and efficiently while extending the technology, research, and science benefits broadly to the public and commercial sectors.

The process objectives are as follows:

- Reduce the cost and development time to deliver products and operational services that meet or exceed customers' expectations;
- Seek out and apply innovative approaches, in cooperation with NASA partners and customers, to enable ambitious new science, aeronautics, and exploration missions;
- Focus on integrated technology planning and technology development driven by Strategic Enterprise and customer needs;
- Facilitate the insertion of technology into all programs and proactively transfer technology, form commercialization partnerships, and integrate all innovative approaches to strengthen U.S. competitiveness;
- Improve and maintain NASA's engineering capability, so that NASA will be recognized as the leading aerospace engineering research and development organization in the world; and
- Capture and preserve engineering and technological best practices and process knowledge to continuously improve NASA's program/project management.

To achieve the goal and objectives for this process:

- **We will focus on what we do best by reestablishing NASA's role as a research and development agency.**

  We will pursue our mission and goals aggressively, preserving each of our four Strategic Enterprises as an essential element of our service to the Nation. We will ensure that the Centers of Excellence are preeminent in their areas of technical expertise. We will emphasize research and development and transfer operational activities, as feasible, to commercial operators, educational institutions, or other Federal agencies. We will continue to seek opportunities to privatize and commercially purchase services that are not our main line of business. We will develop cutting-edge technologies to accomplish our current programs more efficiently and enable new programs necessary to achieve our long-term goals. We will develop technology programs to realize our research and exploration goals, applying new technologies and capabilities to multiple programs.

  We will conduct more frequent missions for fewer dollars, thereby enabling increased opportunities for research, exploration, and discovery.

Generate Knowledge

This is the process by which NASA provides new scientific and technological knowledge from exploring Earth, the solar system, and the universe and from researching the space environment, aeronautics, and astronautics. This knowledge is provided to scientists, engineers, and technologists in industry, academia, and other organizations, as well as to natural resource managers, policymakers, educators, and other NASA customers. This process reflects the first and most basic part of NASA's mission statement and plays a major role in seeking answers to the fundamental questions of science and research.

The goals of this process are to extend the boundaries of knowledge of science and engineering, to

capture new knowledge in useful and transferable media, and to share new knowledge with customers.

The process objectives are to improve the efficiency with which we:

- Acquire advice from diverse communities;
- Plan and set research priorities;
- Select, fund, and conduct research programs; and
- Archive data and publish, patent, and share results.

To achieve the goals and objectives for this process:

- **We will collaborate with old and new partners.**
  We will work with other Federal agencies and U.S. industry to complement and support our activities. NASA will continue to pursue mutually beneficial cooperative activities in aeronautics and space with other nations, strengthening American competitiveness, yet remaining consistent with the Space Act's directive to encourage peaceful international cooperation.

Communicate Knowledge

NASA uses this process to increase understanding of science and technology, advance its broad application, and inspire achievement and innovation. This process also ensures that the knowledge derived from NASA's research and development programs is presented and transmitted to meet the specific needs and interests of each of the Agency's constituency groups.

The goal of this process is to ensure that NASA's customers receive the information derived from the Agency's research and development efforts that they want, when they want it, for as long as they want it.

The process objectives are as follows:

- Highlight existing and identify new opportunities for NASA's customers, including the public, the academic community, and the Nation's students, to directly participate in the space research and discovery experience; and
- Improve the external constituent communities' knowledge, understanding, and use of the results and opportunities associated with NASA's programs.

To achieve the goal and objectives for this process:

- **We will foster partnerships with teachers and students.**
  We will work with teachers and others in the academic community to inspire America's students and create increased learning opportunities. We will help enlighten inquisitive minds and involve teachers and students in our endeavors to seek answers to fundamental questions of research and science.

Resource Requirements and Key Capabilities

NASA's budget and personnel levels are contained in the President's Budget for the current year.

Metrics

NASA's performance metrics are contained in the NASA Performance Plan for the current year.

Related Documents

The other components of NASA's Strategic Management System, including:

- the *NASA Strategic Management Process—Procedures and Guidelines* (NPG 1000.2);
- the current NASA Performance Plan; and
- the NASA Enterprise Strategic Plans;

as well as guiding or related policy statements and laws can be found at:
http://www.hq.nasa.gov/office/codez/plans.html

Contacting NASA

NASA values the comments and recommendations of our stakeholders, customers, partners, employees, the contractor community, and the public that we serve. For further information regarding NASA's Strategic Management System, please contact:

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ACE	Advanced Composition Explorer
ACP	Aviation Capacity program
ACRIM	Active Cavity Radiometer Irradiance Monitor
AEPA	Atmospheric Effects of Aviation program
AGATE	Advanced General Aviation Transport Experiments
ALT-Laser	Laser Altimeter
AST	Aero-Space Technology (Enterprise)
ASTP	Advanced Space Technology program
Astrobiology	The study of the living universe. Provides a foundation for a multidisciplinary study of the origin and distribution of life in the universe, including the role of physical forces, planetary atmospheres, and ecosystem interaction in the evolution with living systems.
Astro materials	The natural, nonbiological materials that constitute the solid bodies of the solar system other than Earth, including planets, satellites, asteroids, comets, and dust. These materials may be studied in situ in their place of origin, collected by missions for return to Earth, or brought to Earth by natural phenomena (meteorites, cosmic dust).
Aviation Capacity program	Technology development program designed to increase air traffic throughput (the number of planes that can safely take off, fly, or land in a given air space)
AvSP	Aviation Safety program
AXAF	Advanced X-ray Astrophysics Facility, now named Chandra X-ray Observatory
Base R&T	Basic long-range research and technology development
CGRO	Compton Gamma Ray Observatory
Discovery program	A program of small planetary missions competitively selected from research community proposals
DoD	Department of Defense
DOE	Department of Energy
DS	Deep Space
EELV	Evolved Expendable Launch Vehicle
El Niño	A climate disturbance occurring every 2 to 5 years in the Pacific Ocean. A region of warm water forms in the western Pacific and moves toward South America, altering weather and rainfall patterns, wind directions, and even the jet stream. El Niño events contribute to floods and droughts in the Americas, Africa, and Australia.
EOCAP	Earth Observation Commercialization Applications program
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EPA	Environmental Protection Agency
ERAST	Environmental Research Aircraft Sensor Technology
Explorer program	A program of small astronomy and space physics missions competitively selected from research proposals
FAA	Federal Aviation Administration
FIRST	Far-Infrared Space Telescope
Future-X	A continuing series of demonstrators containing technologies that are more advanced or alternative to the technologies in X-33 and X-34
GAP	General Aviation Propulsion program
GLAST	Gamma-ray Large Area Space Telescope
Global change	The full range of natural and human-induced changes in Earth's environment, including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems, that may alter the capacity of Earth to sustain life.
GOES	Geostationary Operational Environmental Satellite
GPRA	Government Performance and Results Act of 1993
GPS	Global Positioning System
GRACE	Gravity Recovery and Climate Experiment
HEDS	Human Exploration and Development of Space (Enterprise)
HPCC	High Performance Computing and Communications
HST	Hubble Space Telescope
Human-rated	General term that can best be described as designing piloted vehicle systems in such a manner as to safely accommodate humans and to make use of human-inherent capabilities to ensure the greatest possible probability of a successful mission.

Hyper-X	Hypersonic Test Vehicle
IMAGE	Imager for Magnetopause-to-Aurora Global Exploration
IPCC	International Panel on Climate Change
ISE	Intelligent Synthesis Environment
ISS	International Space Station
LEO	Low-Earth orbit
Lidar	Light detecting and ranging instrument (as opposed to radar, which uses radio waves)
Lunar Prospector	A small Discovery program mission that orbited the Moon
Mars Pathfinder	The Discovery program mission that landed the Sojourner rover on Mars
Microgravity research	Area of scientific application and commercial research concerned with the identification and description of the effects of reduced gravitational forces on physical and chemical phenomena. Microgravity research probes a new parameter in space where gravitational acceleration no longer is equal to 1 g and, instead, can approach values that are orders of magnitude lower.
Mir	Russian space station
NEAR	Near Earth Asteroid Rendezvous
New Millennium program	A space flight program to demonstrate new technologies for use in a subsequent flight validation program
NGST	Next Generation Space Telescope
NIH	National Institutes of Health
NMP	New Millennium program
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen oxide
NSF	National Science Foundation
OMB	Office of Management and Budget
R&D	Research and development
R&T	Research and technology
SAGE	Stratospheric Aerosol and Gas Experiment
SAMPEX	Solar, Anomalous, and Magnetospheric Particle Explorer
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SIM	Space Interferometry Mission
SIRTF	Space Infrared Telescope Facility
SOFIA	Stratospheric Observatory for Infrared Astronomy
SOHO	Solar and Heliospheric Observatory
Space Act	National Aeronautics and Space Act of 1958
SRTM	Shuttle Radar Topography Mission
STEREO	Solar Terrestrial Relations Observatory
TDRSS	Tracking and Data Relay Satellite System
TIMED	Thermosphere-Ionosphere-Mesosphere Energetics and Dynamics
TOMS	Total Ozone Mapping Spectrometer
TRACE	Transition Region and Coronal Explorer
TRMM	Tropical Rainfall Measuring Mission
UEET	Ultra-Efficient Engine Technology (Aeronautics)
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
VCL	Vegetation Canopy Lidar (Mission)
WMO	World Meteorological Organization

A full update of the NASA Strategic Plan will be released on or before September 2000.

To verify that this is the current version of the NASA Strategic Plan, see:
http://www.hq.nasa.gov/office/codez/plans.html

National Aeronautics and
Space Administration

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